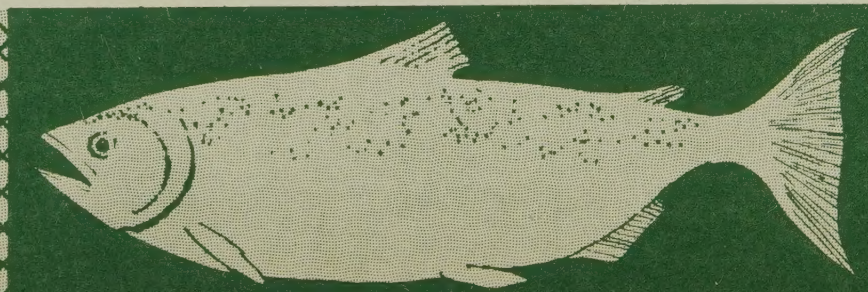
U.S. Fish Wildl. Serv.
Commer. Fish. Abstr.

VOL. 23 No. 4

COMMERCIAL FISHERIES ABSTRACTS

LIBRARY
APR 28 1970
FISH & WILDLIFE SERVICE

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES



UNITED STATES DEPARTMENT OF THE INTERIOR
Walter J. Hickel, *Secretary*
Leslie L. Glasgow, *Assistant Secretary*
for Fish and Wildlife, Parks, and Marine Resources
Charles H. Meacham, *Commissioner*, U.S. FISH AND WILDLIFE SERVICE
Philip M. Roedel, *Director*, BUREAU OF COMMERCIAL FISHERIES

FOREWORD

The Department of the Interior's Bureau of Commercial Fisheries publishes the monthly journal *Commercial Fisheries Abstracts* as one means of communicating to the fishing industry and allied groups the status of current fishery research. The research includes the biological aspects of fishery science as well as technological studies dealing with aquatic resource supply, harvesting, processing, utilization, and distribution.

Commercial Fisheries Abstracts contains summaries of selected articles from trade, engineering, and scientific journals dealing with the entire spectrum of fishery science. The publication is designed to serve the needs of fishery scientists, engineers, and managers in industry, academic institutions, and government by supplying timely information on current progress in fishery research and technology.

Leslie L. Glasgow
Assistant Secretary for Fish and
Wildlife, Parks, and Marine Resources

0.31 DISTRIBUTION OF DIETARY SQUALENE IN A WANDERING ALBATROSS, DIOMEDEA EXULTANS

Lewis, R. W. (Food Chemistry Division, Department of Scientific and Industrial Research, Wellington, New Zealand)
Nature 224, No. 5225, 1220-1221 (December 20, 1969)

The stomach oil of a wandering albatross was found to be 8.6 percent squalene and 77 percent wax esters. Because such a dietary intake of squalene is much higher than would normally be expected, the author determined the concentration of squalene and cholesterol in the bird's subcutaneous fat (pectoral and abdominal regions), muscle (pectoral and thigh), blood (aorta and inferior vena cava), liver, heart, kidney, pancreas, duodenum (and its contents), midgut (and its contents), and brain (cerebrum). Squalene appeared in all the tissues and organs except the brain. Squalene content was directly proportional to lipid content in the muscles, but, since squalene content was relatively moderate in the subcutaneous fat, the author concludes that the solubility of squalene in lipids is not a major factor in its distribution. Since the blood contained an average of 10 p.p.m. and no squalene could be detected in the brain despite the sensitivity of the analytical method used, he also concludes that brain cholesterol undergoes little if any interchange with blood cholesterol after myelinization is complete. The ability of the organs to maintain normal rates of cholesterol synthesis in the presence of excess squalene is shown.
[1 table, 11 references] [Abstracter: L. Baldwin]

0.321 (3.15) RADIATION CHEMICAL STUDIES OF PROTEIN REACTIONS: RADIATION DOSE AND OPTICAL ROTATION

Nisizawa, Mizuho (Department of Chemistry, Defense Academy, Yokosuka, Japan)
Journal of Applied Polymer Science 13, No. 11, 2265-2268 (November 1969)

Irradiation experiments have indicated that the changes in the shape of the external envelope of the protein molecule are accelerated by gamma irradiation. Since the structural changes that accompany a change in the internal relations of the atoms could be significant, the author decided to investigate the effect of radiation on the groups in the vicinity of the asymmetric carbon atoms in the protein molecule. He chose to determine the urea denaturation of the protein as the change in the internal relations of the atoms in the protein molecule, following the determination by measuring the optical rotation of the solution as a function of radiation dose.

An activated state on the position of the groups in the vicinity of the asymmetric carbon atoms was caused in the protein molecule when the protein was irradiated by gamma rays from a cobalt-60 source. The following empirical equation for the change in optical rotation was obtained: $[\alpha] = (b + a \log R)(1 - e^{-kt})$, where $[\alpha]$ is the specific rotation of the solution; R is the gamma radiation dose; t is time; and a, b, and k are adjustable constants. The results showed that the specific rotation does not go to infinity but approaches a limiting value. The increase of the specific rotation with increasing radiation dose suggested to the author that radiation dose does affect the groups in the vicinity of the asymmetric carbon atoms in the protein molecule. [2 figures, 2 references]

0.321 (3.15) RADIATION CHEMICAL STUDIES OF PROTEIN REACTIONS: EFFECT OF PROTECTORS ON THE BREAKING OF SECONDARY BONDING IN PROTEIN

Nisizawa, Mizuho (Department of Chemistry, Defense Academy, Yokosuka, Japan)
Journal of Applied Polymer Science 13, No. 11, 2293-2296 (November 1969)

The bonds in protein can break as a result of radiation or of the effect of urea. In this part of the study on the reaction of protein to radiation, the author determined the effect of protectors (sodium benzoate, monosodium l-glutamate, l-arginine, and thiourea) against radiation on the breaking, caused by urea, of hydrogen bonds in gelatin molecules. He followed the determination by measuring the reduced viscosity of the solution as a function of protector concentration. The following equation was obtained to express the viscosity change: $\eta red = b - a \log X$, where ηred is the reduced viscosity of the solution; X is the concentration of the protector; and a and b are adjustable constants. The results showed a decrease in the reduced viscosity with increasing protector concentration, thereby indicating a protection against the breaking of the hydrogen bonds in the protein. [4 figures, 5 references]

0.33 MECHANISMS OF HEAT DAMAGE IN PROTEINS. 1. MODELS WITH ACYLATED LYSINE UNITS

Bjarnason, J. (Icelandic Fisheries Laboratories, Reykjavik, Iceland), and K. J. Carpenter (School of Agriculture, University of Cambridge, Cambridge, England)
British Journal of Nutrition 23, No. 4, 859-868 (November 1969)

Relatively mild processing or storage conditions can cause a decrease in the nutritive value of the proteins in foods that contain reducing sugars. Seemingly, the nutritive loss is due to Maillard reactions, which occur between the carbonyl groups of the sugars and the free amino groups of the proteins and create enzyme-resistant linkages that make some of the amino acids, particularly lysine, nutritionally unavailable. More severe processing conditions can cause similar losses in foods that do not contain sugars or other molecules with free carbonyl groups. These losses, apparently, are due to the formation of unnatural "amide" bonds between the ϵ-NH_2 group of lysine (or other free amino groups) and carboxyl groups in the proteins. In this first of a series of reports on heat-damage mechanisms in protein, the authors explore the problem of whether or not such linkage can be expected to resist the action of digestive enzymes.

Mammalian kidneys are known to contain ϵ-lysine acylase that hydrolyzes ϵ-N-formyl and acetyl lysines but that is almost inactive with larger acyl groups. By chemical analyses, rat-growth experiments, and metabolism trials, the authors investigated the nutritional effects of acylation of the ϵ-NH_2 group of lysine as such and of lysine units within whole protein chains; propionyl groups as well as

(over)

0.321 (3.15) RADIATION CHEMICAL STUDIES OF PROTEIN REACTIONS: EFFECT OF AMINO ACIDS ON OPTICAL ROTATION

Nisizawa, Mizuho
Journal of Applied Polymer Science 13, No. 11, 2269-2276 (November 1969)

In 1968, the author reported that some amino acid such as sodium glutamate and some benzene-series hydrocarbon such as sodium benzoate protect the unfolding of polypeptide chains that are folded in the protein molecule from the activation effect of gamma radiation. In this part of the study on protein reactions to radiation, he followed the changes in the internal relations of the atoms in the protein molecule by measuring the optical rotation of the solution as a function of the concentration of amino acid.

He found that monosodium l-glutamate, disodium inosine-5-monophosphate, disodium guanosine-5-monophosphate, calcium d-pantothanate, l-arginine, and l-aspartic acid protected the changes in the internal relations of the atoms from radiation damage. The following empirical equation for the protective effect was obtained:

$[\alpha]_f = b - a \log X$, where $[\alpha]_f$ is the final specific rotation of the solution; X is the concentration of the amino acids; and a and b are adjustable constants. The results showed a decrease of the final specific rotation with increasing percentages of amino acid. This decrease indicates that the effect of amino acid on the optical rotation is apparently related to its inhibition of the position changes of the groups in the vicinity of the asymmetric carbon atoms in the protein molecule. [12 figures, 3 references] [Abstracter: L. Baldwin]

0.33

formyl and acetyl groups were attached. Rats receiving a lysine-deficient diet responded to the supplement of ϵ-N-acetyl-L-lysine (but not to the same extent as to the lysine itself); they did not respond to the supplement of ϵ-N-propionyl-L-lysine added at an equivalent level. Appreciable quantities of lysine were recovered from acid hydrolysis of the urine of rats fed the two supplements; chromatographic analysis indicated that the unmetabolized compounds themselves were being excreted. The acylated materials all gave high urinary levels of bound lysine, and the excretion of both propionyl-lysine and propionyl lactalbumin II was equivalent to more than 40 percent of the lysine ingested from these two sources. Although little bound lysine was recovered from the urine of rats fed bovine plasma albumin that had been heat treated for 27 hr. at 145° C., nearly two-thirds of that ingested was recovered in the feces. The results obtained with heat-processed samples suggest that formylated and acetylated materials are less sensitive to further damage than unmodified proteins are.

The authors conclude that the formation of amide linkages between the ϵ-NH_2 groups may well damage the nutritional value of heated proteins, particularly since the biological activity of ϵ-N-acetyl-L-lysine is a special case because of a specific kidney enzyme for which it is a substrate. The essential changes that occur in heat-treated pure protein may be condensations between carboxyl and ϵ-NH_2 lysine groups; however, if this is so, the products are largely indigestible. If indigestible cross linkages between peptide chains are present, the absence of lysine-containing compounds in the urine of the rats fed heat-processed protein would be accounted for. [5 tables, 20 references]

0.32 (4.5) LOSS OF METHIONINE IN CASEIN DURING STORAGE WITH AUTOXIDIZING METHYL LINOLEATE

Tannenbaum, S. R., Howard Barth, and J. P. Le Roux (Department of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge 02139)
Journal of Agricultural and Food Chemistry 17, No. 6, 1353-1354 (November-December 1969)

This paper reports on a study of the changes in metionyl residues of proteins as a result of lipid oxidation. A procedure was developed that could distinguish between methionine and methionine sulfoxide in intact proteins (acid hydrolysis partially converts methionine sulfoxide back to methionine). The concentration of unreacted methionine was followed in a model system (consisting of casein--nine parts--and methyl linoleate--one part) in storage at relative humidities of 0, 33, and 75 percent. In each case, the loss of methionine was proportional to the amount of protein-bound nonenzymatic browning pigment. Apparently, the methionyl residues act as peroxide decomposers with the concomitant formation of carbonyl compounds leading, in turn, to nonenzymatic browning.
[1 figure, 2 tables, 12 references] [Abstracter: F. T. Piskur]

0.320 BITTER PEPTIDES IN TRYPTIC HYDROLYSATE OF CASEIN

Matoba, Teruyoshi, Chizuko Nagayasu, Rikimaru Hayashi, and Tadao Hata (Research Institute for Food Science, Kyoto University, Kyoto, Japan)
Agricultural and Biological Chemistry 33, No. 11, 1662-1663 (November 1969)

Peptides having a bitter flavor are produced by proteolytic hydrolysis of protein. The authors, in order to gain more information on the chemical properties of bitter peptides, isolated three different bitter peptides from the tryptic hydrolysate of casein and estimated the amino-acid sequence of them.

The primary structures of the three peptides were proposed as follows: peptide 1, Gly-Pro-Phe-Pro-Val-Ileu; Peptide 2, Phe-Phe-Val-Ala-Pro-Phe-Pro-Glu-Val-Phe-Gly-Lys; and Peptide 3, Phe-Ala-Leu-Pro-Glu-Tyr-Leu-Lys. All three peptides had the amino acids proline and phenylalanine in common.
[1 table, 5 references] [Abstracter: F. T. Piskur]

2.3 (2.8) GLYCERIDE FRYING OILS

U.S. Patent 3,460,948
Linteris, L. L., and J. P. McNaught; Lever Bros. Co. (pat.)
Food Technology 23, No. 12, 71 (December 1969)

Citrus oils are added to frying oils to reduce undesirable cooking odors.
[Abstracter: F. T. Piskur]

3.4 (2.3) SMOKING APPARATUS

German Pending Application 1,492,670
Pfiller, A. (pat.)
Food Technology 23, No. 12, 69 (December 1969)

Fish (and meat) are precured, smoked, and cooked in a multichamber conveyor apparatus.
[Abstracter: F. T. Piskur]

0.34 NITROSAMINES AS ENVIRONMENTAL CARCINOGENS

Lijinsky, William (Eppley Institute for Research in Cancer, University of Nebraska College of Medicine), and Samuel S. Epstein (Laboratories of Environmental Pathology and Toxicology, Children's Cancer Research Foundation, Inc., and Department of Pathology, Harvard Medical School)
Nature 225, No. 5227, 21-23 (January 3, 1970)

In 1967, Magee et al. reported that of a broad series of nitrosamines they had tested, most were carcinogenic in a wide range of organs of various species. In 1968, Sander showed that secondary amines will react with nitrite to form nitrosamines in conditions of defined pH and in other conditions similar to those in the mammalian stomach. The present authors examined the environmental distribution of nitrites and secondary amines as essential precursors of nitrosamines in an attempt to account for some epidemiological aspects of human cancer.

Nitrates (from which nitrites are formed), nitrites, and secondary amines are fairly ubiquitous. They are found, respectively, in plants, water, and preservatives for meat and fish; in stored green vegetables; in fish meal, fish products, cereals, tea, tobacco, tobacco smoke, alcoholic beverages, flavoring agents, and some drugs. Cooking can be the source of secondary amines. The authors conclude that, although not all nitrosamines are carcinogenic and although the nitrites and secondary amines must be present simultaneously in the stomach to form nitrosamine, in vivo formation of nitrosamines from ingested nitrites and certain secondary amines is potentially a serious health problem. They recommend that

(over)

 Abstracter: L. Baldwin

0.35 THE EMULSIFYING CAPACITY OF BOVINE MUSCLE TISSUE AS RELATED TO TIME POST-MORTEM AND MICROBIAL CONTAMINATION

Graner, Murilo, V. R. Cahill, and H. W. Ockerman (Ohio State University, Columbus 43210 and Ohio Agricultural Research and Development Center, Wooster 44691)
Food Technology 23, No. 12, 94-97 (December 1969)

Fat-binding (and water-holding) capacity of muscle tissue is important in sausage making. The fat-binding power of the muscle tissue is influenced by time post-mortem and by microbial contamination. In the present study, the effect of time post-mortem and of microbial contamination on the emulsifying capacity of the semitendinosus muscle of dairy cows was determined. Samples of tissue with a low level of microbial contamination were prepared by treating the samples with water at 90° to 100° C. The treated samples were stored at 1° to 4° C. The tissues were examined for emulsifying capacity during a 26-day storage period. The emulsifying capacity decreased from the first half hour to the third day then increased during the entire storage period. The samples conventionally prepared (having a higher degree of microbial contamination) had a higher emulsifying capacity than the samples having a low level of contamination had.
[2 figures, lttable, 15 references]

 Abstracter: F. T. Piskur

0.38 (1.51)(0.4) CHARACTERIZATION OF A MAJOR ALLERGEN (COD). EFFECT OF ENZYMIC HYDROLYSIS ON THE ALLERGENIC ACTIVITY

Aas, K., and S. M. Elsayed (Pediatric Department and Pediatric Research Institute, Rikshospitalet University Hospital, Oslo, Norway; and Department of Biochemistry, University of Oslo)
Journal of Allergy 44, No. 6, 333-343 (December 1969)

In several papers published in 1967 and 1968, the senior author reported the isolation of a highly active allergenic fraction from cod (Gadus callarias L.). In the paper presented here, he attempts to assess the effect of enzymic digestion on the allergenic activity of the major allergenic fraction (DS22). The fraction was hydrolyzed with proteolytic enzymes and carbohydrases and subjected to in vivo digestion. The effects of these processes on the fraction's allergenic activity (measured by the ability to induce skin-test reactivity) and its antigenic capacity to react with specific rabbit antisera were determined. Extensive hydrolysis with trypsin, pepsin, subtilisin, and pronase completely destroyed both properties; partial hydrolysis resulted in gradual loss of both characterstics, both reaching complete disappearance at about the same extent of hydrolysis. Treatment with elastase, an endopeptidase particularly attacking neutral residues, left a product containing one or two antigenic determinants as well as some of the allergenic activity. The indication, then, is that the allergenic activity is governed by antigenic determinants of a protein or polypeptide above a certain critical size, but less than 14,000-16,000 M.W.
[4 figures, 1 table, 34 references]

 Abstracter: L. Baldwin

0.38 (3.15) EFFECTS OF GAMMA RADIATION ON THE CHEMICAL AND PHYSICAL PROPERTIES OF LACTATE DEHYDROGENASE

Winstead, Jack A., and Tyron C. Reece (Radiobiology Division, USAF School of Aerospace Medicine (AFSC), Brooks Air Force Base, Texas 78235)
Radiation Research 41, No. 1, 125-134 (January 1970)

The authors undertook this study to determine what chemical and physical properties, in addition to the sulfhydryl groups (the subject of a number of investigations over the past 15 years), of lactate dehydrogenase are sensitive to gamma radiation.

When lactate dehydrogenase was irradiated with ^{60}Co, some of the amino acids--principally alanine, cysteine, serine, methionine, tryptophan, tyrosine, and valine--were degraded; the sedimentation coefficient increased and the diffusion constant decreased. Both the sedimentation data and the molecular-weight data indicated an aggregation of the irradiated enzyme. The Michaelis constant was increased by pyruvate but was unaffected by reduced nicotinamide adenine dinucleotide. Since the readily titratable sulfhydryl groups increased after irradiation, the authors suggest that an unfolding of their tertiary structure occurred. Two moles of p-chloromercuribenzoic acid bound to the unirradiated enzyme caused an approximate 50 percent loss of biological activity; it caused no additional loss in the irradiated enzyme. The authors suggest that bonds involved in the tertiary structure are probably susceptible to radiation damage and that radiation damage to lactate dehydrogenase is initiated by the breaking of these bonds.
[2 figures, 7 tables, 25 references]

 Abstracter: L. Baldwin

0.35 (0.4) PURIFICATION AND BINDING PROPERTIES OF NURSE SHARK ANTIBODY

Voss, Edward W., Jr., Warren J. Russell, and M. Michael Sigel (Department of Microbiology, University of Illinois, Urbana; and the Department of Microbiology, University of Miami School of Medicine, Coral Gables, Florida)
Biochemistry 8, No. 12, 4866-4872 (December 1969)

Various authors reporting on antigen-binding studies of various IgM immunoglobulins have reported various findings regarding the number of combining sites per antibody molecule. Because of this diversity, the authors decided to study the IgM molecule in depth. They used nurse sharks as their model system because of the presence of 18S and 7S IgM antibody protein, in quantity, and the apparent absence of 7S IgG. Sharks immunized with 2,4-dinitrophenylhemocyanin produced antibodies to the 2,4-dinitrophenyl (2,4-DNP) haptenic group. Equilibrium dialysis binding studies on the purified 18S and 7S immunoglobulin antibodies showed a valence of five for the 18S component and one for the 7S component. These studies also showed that the 18S and the 7S molecules have similar binding constants (2×10^5 l./mole); corroborative fluorescence-quenching studies showed they have identical titration curves. The two molecular forms gave identical spectral shifts with bound ligand; however, the shift was qualitatively different from the shift reported by Little and Eisen (1967) for mammalian anti-DNP antibodies. On the basis of the binding data, the authors suggest that the 7S IgM molecule is potentially either a synthetic precursor or a breakdown subunit of the 18S IgM antibody molecule. [8 figures, 1 table, 26 references] [Abstracter: L. Baldwin]

0.34

consideration be given to the reduction or elimination of one of these reactants from the diet, suggesting that, on the immediate practical level, reduction in the amount of nitrite and nitrate added as preservatives to food, particularly to meat and fish, should not be difficult. The result, they say, may be a decrease in the incidence of human cancer. [40 references]

0.33 NONENZYMATIC BROWNING IN A LACTOSE-CASEIN MODEL SYSTEM

Ferretti, Aldo and V. P. Flanagan (Dairy Products Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, USDA, Washington, D.C. 20250), and J. M. Ruth (Pesticide Chemicals Research Branch, Entomology Research Division, USDA, Beltsville, Md. 20705)
Journal of Agricultural and Food Chemistry 18, No. 1, 13-18 (January-February 1970)

Forty compounds were isolated and identified from a dichloromethane extract of a model lactose-casein browning system in the "dry" state. These compounds consisted of: 13 furanics, 9 lactones, 5 pyrazines, 2 pyridines, 2-acetyl pyrrole, 2 amides, pyrrolidinone, succinimide, glutarimide, 2 carboxylic acids, acetone, 2-heptanone, and maltol. The Maillard-type lactose-casein interaction may account for many of the compounds. In addition, D-galactose, D-tagatose, and lactulose was found in the browned mixture.
[1 figure, 1 table, 58 references] [Abstracter: F. T. Piskur]

2.3 FISH PROCESSING APPARATUS

U.S. Patent 3,460,193
Yoshida, S. (pat.)
Food Technology 23, No. 12, 69 (December 1969)

Pairs of knives on a rotating flywheel cut out the dark meat area along the lateral line of the fish. [Abstracter: F. T. Piskur]

0.38 MULTIPLE FORMS OF LACTATE DEHYDROGENASE IN THE COD, GADUS MORHUA L.

Odense, P. H., T. C. Leung, T. M. Allen, and E. Parker (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia)
Biochemical Genetics 3, 317-334 (1969)

The patterns of the isoenzymes of fish lactate dehydrogenase are characteristic of the tissue and the species of fish. In 1965, Markert and Faulhaber classified 30 species of fish on the basis of the lactate dehydrogenase isoenzyme bands found in each species. Although a two-subunit system accounts for most of the L-lactate dehydrogenase patterns found in these fishes, Hochachka (1966) and Morrison and Wright (1966) postulated the presence of additional subunits in order to account for the complex lactate dehydrogenase patterns of trout tissues. Also, genetic variants of lactate dehydrogenase subunits have been found in fish tissues. In the present paper, the authors postulate the presence of five types of subunits to explain the lactate dehydrogenase zymogram patterns of cod tissues.
[15 figures, 3 tables, 14 references] [Abstracter: F. T. Piskur]

2.3 MOLLUSK PROCESSING

U.S. Patent 3,460,192
Marvin, J., and T. Henderson, Jr. (pat.)
Food Technology 23, No. 12, 69 (December 1969)

The apparatus selectively severs the tongue, mantle muscle, and stomach of the mollusk. [Abstracter: F. T. Piskur]

0.38 (6.32) PURIFICATION AND PARTIAL CHARACTERIZATION OF PEROXIDASE FROM RED ALGAE

Murphy, M. J., and C. Ó hEocha (Department of Biochemistry, University College, Galway, Irish Republic)
Biochemical Journal 115, No. 3, 12p (November 1969) (Proceedings of the Biochemical Society: Communications)

Earlier workers reported that halogenated organic compounds are present in various red algae, and that halogenation in mammals and in some fungi is catalyzed by peroxidase. These observations led the present authors to undertake a survey of peroxidase in appropriate species of the Rhodophyta.

The algal peroxidase has an optimum pH of between 5.2 and 5.8, and maximum activity was obtained with 0.8 mM-hydrogen peroxide. The enzyme was most stable at a pH of about 9.0. The molecular weight of the algal peroxidase was about 40,000. The peroxidase showed unusual substrate specificity; positive results were obtained with o-dianisidine, o-toludine, and p-phenylenediamine, whereas other well-known peroxidase substrates, such as benzidine and guaiacol, did not react. [7 references] [Abstracter: F. T. Piskur]

0.4 (4.91) INHIBITION OF LYMPHATIC ABSORPTION OF CHOLESTEROL BY CHOLESTANE-3β,5α,6β-TRIOL

Ito, M., W. E. Connor, E. J. Blanchette, C. R. Treadwell, and George V. Vahouny (Department of Internal Medicine, University Hospitals, University of Iowa, Iowa City 52240, and Departments of Biochemistry and Anatomy, School of Medicine, The George Washington University, Washington, D.C. 20005)
Journal of Lipid Research 10, No. 6, 694-702 (November 1969)

This paper reports on the effect of cholestane-3β,5α,6β-triol (CT) on the intestinal absorption of cholesterol and oleic acid and the absorption of labeled CT in lymph-duct-cannulated rats. CT, administered in an aqueous emulsion together with cholesterol to rats, results in a depression of lymphatic absorption of the cholesterol and in increased fecal excretion of sterols. CT had no influence on the distribution of labeled oleic acid among the intestinal or lymph lipid fractions nor on the percentages of free and esterified cholesterol-7α-^{3}H in these tissues. The authors showed that a possible mechanism for CT inhibition of cholesterol absorption is the competition for the enzyme cholesterol esterase that esterifies cholesterol prior to entrance into the lymphatic system. CT is poorly esterified and poorly absorbed, but CT is effective in inhibiting esterification of cholesterol in vitro. These findings are of interest relative to development of atherosclerosis because the accumulation of CT in the mucosal cell following feeding specifically interferes with cholesterol absorption, with no significant effect on absorption of fatty acid.
[8 figures, 6 tables, 19 references]

 Abstracter: F. T. Piskur

0.5 COMPARISON OF THE FATTY ACIDS OF PROTEOLYTIC TYPE B AND NONPROTEOLYTIC TYPES E AND F OF CLOSTRIDIUM BOTULINUM

Kimble, C. E., M. L. McCollough, V. A. Paterno, and A. W. Anderson (Department of Microbiology, Oregon State University, Corvallis 97331)
Applied Microbiology 18, No. 5, 883-888 (November 1969)

This paper reports on the fatty acid composition of Clostridium botulinum, a radiation-resistant spore-former. The study was the first step in an investigation of the possible relation between the lipids of this organism and its resistance to radiation. An additional purpose of the study was to explore the possibility of using the fatty acid composition as a criterion for differentiating the chiefly proteolytic C. botulinum types A and B from the nonproteolytic types E and F.

The lipids were extracted from the vegetative cells and spores of C. botulinum. For types 61E, F, and 115B, total lipids averaged 3.8 percent of the dry weight of the vegetative cells and 2.5 percent of the dry weight of the spores. The fatty acids of the lipids included straight chain, saturated, unsaturated, and cyclopropane acids. Hexadecanoic and tetradecanoic acids were the predominant fatty acids in the spores and in the vegetative cells, constituting over 50 percent of the total fatty acids. Unsaturated fatty acids constituted the second major group and consisted primarily of 7,8-tetradecenoic; 9,10-hexadecenoic; 7,8-hexadecenoic; 11,12-octadecenoic; and 9,10-octadecenoic acids. The nonproteolytic types 61E and "F" contained an 18-carbon diunsaturated fatty acid that was not present in the vegetative cells or spores of the proteolytic type 115B.
(3 figures, 2 tables, 19 references)

 Abstracter: F. T. Piskur

0.5 FRAGIN, A NEW BIOLOGICALLY ACTIVE METABOLITE OF A PSEUDOMONAS. PART I. ISOLATION, CHARACTERIZATION AND BIOLOGICAL ACTIVITIES

Murayama, Akira (Department of Agricultural Chemistry, The University of Tokyo, Tokyo, Japan), Kosei Hata, and Saburo Tamura
Agricultural and Biological Chemistry 33, No. 11, 1599-1605 (November 1969)

A new biologically active substance named fragin was isolated from a broth culture of a bacterium identified as a strain of Pseudomonas fragi. The isolation, characterization, and biological activities of fragin are described. Fragin is a monobasic acid with the molecular formula $C_{13}H_{25-27}O_3N_3$. It is easily soluble in most organic solvents but slightly soluble in hexane. It is insoluble in water except under alkaline conditions.

Fragin is stable at room temperatures when kept in the dark, but it gradually decomposes in the light. It is unstable in organic solvents.

Fragin inhibited the growth of chlorella at a concentration of 20 p.p.m. in the cup-plate test. Furthermore, it inhibited growth of lettuce seeds at 150 p.p.m. and growth of lettuce seedlings at 20 p.p.m.
[11 figures, 2 tables, 6 references]

 Abstracter: F. T. Piskur

0.7 (9.14) KREBSE BEI RATTEN UND MÄUSEN NACH FÜTTERUNG MIT KOMMERZIELLEM FISCHFUTTER [CANCER IN RATS AND MICE FED WITH COMMERCIAL FISH FEEDS]

Hueper, Wilhelm C. (4558 McGregor Boulevard, Fort Myers, Florida 33901)
Zeitschrift Krebsforschung 73, No. 2, 141-148 (November 1969) (In German, English summary)

Two different feeds that had caused a high incidence of primary liver cancer in rainbow trout raised in the United States, Italy, Germany, and Japan were fed to rats and mice. The feeds caused benign tumors of the liver and adenocarcinomas of the stomach and colon in some of the animals; they also caused leukemia in the mice. In animals with liver tumors, degeneration and necrosis of liver cells occurred; in animals without such tumors, degeneration and necrosis was rare. Subcutaneous injection of alcohol extracts of one of the feeds failed to produce cancerous responses either at the site of injection or in organs and tissues remote from the site. The author suggests that these results do not support previously held beliefs that contamination of fish feeds by aflatoxin is the principal cause of liver cancers in trout. He recommends that, because of the uncertainty surrounding the actual cause of these tumors, the sale for human consumption of rainbow trout with liver cancer be prohibited by law.
[4 figures, 1 table, 21 references]

 Abstracter: L. Baldwin

0.5 PSYCHROPHILIC PROPERTIES AND THE TEMPERATURE CHARACTERISTIC OF GROWTH OF BACTERIA

Baig, I. A., and J. W. Hopton (Department of Microbiology, University of Birmingham, Birmingham, England)
Journal of Bacteriology 100, No. 1, 552-553 (October 1969)

Attempts have been made in recent years to develop a meaningful terminology for the growth and metabolic properties of microorganisms relative to temperature. This paper is a report of an attempt to relate physchrophilic properties of bacteria to the temperature characteristic μ. The temperature characteristic is derived by substituting growth rate in the Arrhenius equation. Growth rates of the organisms at seven different temperatures were determined. Arrhenius plots were drawn and the temperature characteristic μ was calculated for 10° C. temperature intervals by the formula:

$$\mu = \frac{2.303\ R\ T_1\ T_2\ (\log k_2 - \log k_1)}{T_2 - T_1}$$

where k_1 and k_2 are the growth rate constants at absolute temperatures T_1 and T_2, respectively. The results indicated that, within the groups, those organisms that had the fastest growth rates at 5° and 10° C. had the lowest temperature characteristics and the correlation was best with the temperature over the range 15° to 25° C. Because most of the organisms examined had been isolated from one ecological situation, it is conceivable that a low temperature and psychrophilic properties are unrelated attributes of bacteria capable of persisting in natural waters.
[2 tables, 6 references] [Abstracter: F. T. Piskur]

0.7 PHOSPHOLIPID SYNTHESIS IN MICROSOMES

Anonymous
Nutrition Reviews 27, No. 10, 289-292 (October 1969)

The organization of cellular activities depends upon membrane function; however, very little is known about the mechanisms involved in membrane synthesis. For example, one question that arises is: Are the protein and lipid components of membranes syntnesized at the same rate? Considerable progress has been made in determining the reactions involved in the synthesis of phospholipids--major lipid components of cell membranes. This paper summarizes the available information on the subject. The incorporation of arachidonate into rat liver phospholipids appears to occur chiefly through esterification of lysophospholipids formed within the cell. The de novo synthesis of phospholipids is a more important pathway in formation of the less highly unsaturated phospholipids.
[10 references] [Abstracter: F. T. Piskur]

0.6 SULFITE PRESERVATIVE REMOVAL

U.S. Patent 3,468,674
Levin, E. (pat.)
Food Technology 24, No. 1, 48 (January 1970)

Meat or fish that contain sulfurous acid is made suitable for consumption by converting the sulfurous acid to sulfate and sulfite residues by heating or azeotropic distillation, or both. [Abstracter: F. T. Piskur]

0.39 (0.4) FLUID COMPARTMENTS OF ISLET AND OTHER TISSUES OF THE TOADFISH OPSANUS TAU

Cooperstein, S. J. (Department of Anatomy, University of Connecticut Schools of Medicine and Dental Medicine, Farmington 06032), Arnold Lazarow (University of Minnesota Health Sciences Center, Minneapolis 55414), and James A. Jackson (Marine Biological Laboratory, Woods Hole, Massachusetts 02543)
American Journal of Physiology 217, No. 6, 1776-1783 (December 1969)

In continuation of a study of the physiology of the islets of Langerhans, the authors measured (1) the uptake of a number of injected sugars and amino acids by the islet of the toadfish, (2) the fluid volume and the rate of equilibration of both the extracellular and the total water, and (3) the size of the extracellular compartment in various tissues. They used the toadfish because, unlike mammals', the toadfish's islet tissue is segregated into discrete bodies that are relatively free of acinar tissue.

Following injection of radiolabeled mannitol, inulin, alloxan, and urea, the authors measured the distribution of radioactivity in the toadfish's tissues. They found that the extracellular fluid volume of the different tissues (mannitol, inulin, and alloxan spaces as percent of tissue weight) was 35 percent in islet, 22 percent in liver, 40 percent in heart, from 10 to 15 percent in muscle, 33 percent in kidney, 43 percent in gills, and 5 percent in the brain. The water content, expressed as a percent of tissue weight, of the toadfish is compared with corresponding values reported by other investigators for other fish, animals, and man. The equilibration rates of the three extracellular indicators are compared.
[8 figures, 3 tables, 55 references] [Abstracter: L. Baldwin]

0.5 GROWTH, SPORULATION, AND GERMINATION OF CLOSTRIDIUM PERFRINGENS IN MEDIA OF CONTROLLED WATER ACTIVITY

Kang, Chunghee K., Margy Woodburn, Andrea Pagenkopf, and Roberta Cheney (Department of Foods and Nutrition, School of Home Economics, and Agricultural Station, Purdue University, Lafayette, Indiana 47907)
Applied Microbiology 18, No. 5, 798-805 (November 1969)

Certain strains of Clostridium perfringens are considered to be the cause of gastroenteritis when taken in large numbers in food or water. An understanding of the influence of available water in foods on the growth, sporulation, and germination of the organism may be useful in control of C. perfringens as a cause of foodborne illness. This paper reports on a study of the requirements in terms of water activity (a_w) for the growth, sporulation, and germination of C. perfringens in laboratory media. Strain A48 (not heat-resistant) and either NCTC8239 or NCTC8797 were used in the studies. Glycerol, sucrose, and sodium chloride were used to obtain the desired a_w of the test media. The a_w levels of the media were determined by the freezing points of the media. Fluid Thioglycollate Medium was used as the basal medium for the growth and germination studies. The medium had an a_w of 0.995 and produced maximum growth and fastest growth rate of the organism among the six levels of a_w tested (0.995, 0.98, 0.97, 0.95, 0.93, and 0.91). The lowest a_w that supported growth and germination of C. perfringens was from 0.97 to 0.95 in the test media adjusted with sucrose or sodium chloride and 0.93 and 0.91 in the test media adjusted with glycerol. A higher a_w was required by the organism for spore production in Ellner's medium or modified medium than was required for growth.
[3 figures, 5 tables, 12 references] [Abstracter: F. T. Piskur]

0.7 MALONDIALDEHYDE AND LIVER DNA

Anonymous
Nutrition Reviews 27, No. 11, 316-318 (November 1969)

Glyoxal (OHC-CHO) has been found to be toxic to human fibroblasts in cell culture. The toxicity resulted from an inhibition of DNA and protein synthesis, perhaps through interaction of glyoxal with DNA. This observation led to a study of the interaction of glyoxal or malondialdehyde (MDA) with DNA in vitro, as well as on the growth of cultured fibroblasts. The possibility that MDA ($OHC-CH_2-CHO$) would have a similar toxic effect is of considerable biological significance because of the formation of MDA in food products and in tissue lipids as a result of peroxidation of unsaturated fatty acids. Peroxide formation and MDA formation may be greater when the tissue contains high levels of polyunsaturated fatty acids.

Deterioration of mitochondrial function is also associated with an increase in MDA, presumably formed from peroxidation of mitochdonrial polyunsaturated fatty acids. In addition, MDA can result in cell damage by reaction with proteins, probably with the epsilon-amino group of lysine and with N-terminal aspartic acid groups to cause a cross-linking. Furthermore, although degradation of DNA does not appear responsible for the major changes during aging, changes in DNA structure could be an important factor if they resulted in decreased synthesis of RNA species needed for synthesis of specific cell proteins.

Klamerth and H. Levinsky studied the template activity of rat liver DNA in vitro, either by incubating DNA from normal rats with various amounts of MDA or

(over)

 Abstracter: F. T. Piskur

1.87 MAJOR CHANGES CALLED FOR IN MAINE LOBSTERING
(9.6)(1.0115)
(9.3)

Davisson, Farrell (reviewer)
The Lobster Industry, Its Operation, Financing and Economics
John P. Reeves (Bar Harbor Banking and Trust Co., Bar Harbor, Maine 04609)
National Fisherman 50, No. 10, 20B, 23B (February 1970)

This 132-page thesis was submitted in partial fulfillment of the requirements for graduation from the Stonier Graduate School of Banking, a school operated by the American Banking Association in cooperation with Rutgers University. It is based on information obtained over a 2-year period from fishermen, lobster buyers, wholesalers, pound operators, suppliers, and bankers involved in lending money to the lobster industry. It is directed toward the lattermost. Among its recommendations are the following:

1. The present $10 fee for a Maine lobstering license should be increased by $10 a year until the yearly fee reaches $100. Of the approximately 6,000 licenses issued each year, only 1,500 go to full-time lobstermen. The increase in license fees would eliminate the marginal and part-time fishermen and force the full-time fishermen to find more efficient ways of increasing their catch.
2. Money from the fees should be used for research in all areas of the industry. Biological and ecological studies are needed to determine the causes of the apparent decline in the inshore population; these studies would cover the

(over)

 Abstracter: L. Baldwin

0.7 FATTY ACIDS IN NEWER BRANDS OF MARGARINE
(4.91)

Miljanich, Peter, and Rosemarie Ostwald (Department of Nutritional Sciences, University of California, Berkeley)
Journal of the American Dietetic Association 56, No. 1, 29-30 (January 1970)

The water and fat content and the fatty acid composition of 10 newer margarine products were determined. Some of the data are listed in the following table:

Sample	Moisture	Fat	Fatty acid content in grams per 100 grams of margarine			
			Palmitic acid	Stearic acid	Oleic acid	Linoleic acid
Number	percent	percent				
1	16.8	78.5	10.3	5.9	37.1	20.7
2	16.0	80.2	10.6	6.6	34.8	22.0
3	15.2	80.1	14.5	7.2	29.5	24.2
4	15.8	79.2	9.3	5.3	30.5	25.5
5	15.9	79.4	10.5	7.7	28.6	26.0
6	56.2	41.1	5.1	2.8	14.3	15.4
7	16.3	78.8	9.1	5.4	27.2	32.2
8	56.4	37.1	4.1	1.6	11.0	18.2
9	15.4	80.0	7.3	4.7	23.3	40.2
10	16.6	82.1	7.0	4.3	18.6	47.7

(over)

 Abstracter: F. T. Piskur

2.05 SALMONELLA--MENACE OR MYTH?

Thomas, R. Dean (Delst Chemical and Research Co., Anaheim, California)
Feedstuffs 42, No. 1, 19,31 (January 3, 1970)

A great deal of time and money is being spent testing feeds and feed ingredients to establish the presence or absence of salmonella. To justify this expenditure, researchers are calling salmonellosis a major disease problem both in terms of public health and animal production. In a previous article [see Commercial Fisheries Abstracts, March 1969], the author took the position that salmonellosis is of much less importance than a number of other diseases, that deaths from salmonellosis are considerably fewer than deaths from even some of the very minor diseases, and that the work being done to eradicate salmonella is out of proportion and unwarranted. In the present article, he addresses himself to commonly advanced justifications for continued work on the "problem."

It has been suggested that work on salmonellosis is important because of the many manhours that are lost as a result of workers' having the disease. A survey by the author revealed that time lost as a result of workers' having food poisoning from all causes, not just from salmonellosis, is incidental compared to the time lost from colds, flu, or female problems. Moreover, a study of the food poisoning outbreaks in California (reported at the Western Experiment Station Collaborators Conference on "The Destruction of Salmonellae" in Albany, California, March 9, 1966) showed that only 8 percent of the recorded food poisoning incidents were caused by salmonella; 20 percent were caused by staphylococcus. Large numbers of live salmonella organisms must be ingested as a rule before any symptoms

(over)

 Abstracter: L. Baldwin

0.7

Some of the information that appeared on the labels of the margarines was as follows (numbers refer to sample brand numbers in the table):

1. Liquid corn oil; partially hydrogenated corn oil.
2. Partially hardened soybean oil; partially hardened and liquid cottonseed oil.
3. Liquid cottonseed oil (nonhydrogenated); partially hydrogenated soybean oil.
4. Partially hydrogenated soybean and cottonseed oils.
5. Partially hydrogenated soybean and cottonseed oils.
6. Imitation margarine. Water; partially hydrogenated soybean oil.
7. Liquid corn oil; partially hydrogenated corn oil.
8. Imitation margarine. Water; liquid corn oil; partially hardened corn oil.
9. Partially hardened soybean, safflower, and cottonseed oils.
10. Liquid safflower oil; hardened safflower and cottonseed oils.

[1 table, 9 references]

0.8 SIZE REDUCTION (0.115)(0.6)

Snow, Richard H.
Industrial & Engineering Chemistry 61, No. 11, 102-111 (November 1969)

This annual review reports on publications dealing with theoretical and practical grinding research. The various sections cover: Fracture behavior, Mill performance, Mill circuit simulation and control, Applications, Classifiers, Particle size analysis, and Particle behavior.
[3 figures, 203 references] [Abstracter: F. T. Piskur]

0.7 FEEDING THE MILLIONS (9.6)

Cooke, G. W. (reviewer)
Population and Food Supply. Essays on Human Needs and Agricultural Prospects
Sir Joseph Hutchinson (ed.)
Cambridge University Press, London, viii + 144 pp. (October 1969) $4.95.
Nature 225, No. 5227, 105-106 (January 3, 1970)

These essays are based on a series of open lectures that were arranged by the Faculty Board of Agriculture of the University of Cambridge. Individual lecturers define the problem, discuss the prospects of controlling human fertility and population growth, review the factors that prevented a population explosion before now, discuss the essentials of quality diets, examine the practicality of distributing surpluses, describe systems of land tenure as an obstacle to improving agriculture, and outline the basic resources of crops and stock, climate and soil throughout the world. [Abstracter: L. Baldwin]

2.05

appear, whereas clostridium and staphylococcus give off their toxins into the food and, even if they die or be removed, the toxic effects will remain. Salmonella is very sensitive to heat; staphylococcus enterotoxin will resist boiling for 30 minutes, and clostridium spores can survive in boiling water under certain conditions. Research effort seems to be focused on the wrong organism.

It has also been reported that salmonella will grow in meat meal and form pockets of contamination if the moisture level is suitable. Since salmonellae are sensitive to a low pH substrate, the author studied their growth in wet meat meals whose pH he had adjusted to 7.0 with sodium hydroxide and then lowered in 0.5 increments to 4.5 with phosphoric acid. Taking 10-gram aliquots at each pH, he inoculated them in triplicate with about 0.02 ml. each of a 24-hour culture of Salmonella typhosa or Salmonella cholerasius. When no growth was evident after 48 hours, he reinoculated the samples with 0.1 ml. of the cultures. After another 48 hours, he again found no evidence of growth of either species, even in the controls (pH 7.0). He suggests that someone should check to see if salmonella can even grow in meat meal, for it bears on the materials handling required for a salmonella-free product.

The author concludes his article by pointing out that, at last count, 22 Government agencies and the World Health Organization are participating in research projects involving salmonella; meetings on the "problem" are being held continually; members of the feed and rendering industries are accepting the cost and burden of unchallenged demands for the eradication of salmonella. With all the chronic and crippling diseases that we cannot cure, and with all the research on more important problems that is being phased out for lack of funds, can we afford to continue the work on salmonella, he asks.

0.7

by determining the template activity of liver DNA from rats fed with MDA. The ability of DNA to act as a template for RNA synthesis catalyzed by RNA polymerase is a measure of the integrity of the isolated DNA. Thus, alterations in DNA structure caused by MDA should be reflected in reduced template activity, i.e., reduced incorporation of ^{3}H-uridine triphosphate into RNA in this system.

When DNA and MDA were incubated in vitro, an almost complete loss of template activity occurred. The greater decrease occurred in young rats injected with MDA.

[12 references] [Quoted in part]

1.87

effect of cyclical changes in sea-water temperature on the size of the annual catches and the effect on the catches of pollution and alterations of the environment by filling and dredging. Conservation studies into the practicality of regulations governing minimum and maximum sizes are needed. Research into more efficient methods of fishing is required, for although traps may be effective, they are not of optimum efficiency. Analyses of marketing, promotion, and distribution systems should be directed toward stabilizing seasonal fluctuations in supply.

3. The law that prohibits the catching of lobsters by other than conventional means should be challenged. This law deters inventors from showing any initiative.

4. A closed-season system should not be advocated unless it has been proved to be effective as a means of conservation. Such a system, in effect, turns all lobstermen into part-time fishermen and stifles the goal of fewer lobstermen.

5. A law should be considered that would limit the number of traps each fisherman is allowed to set. Such a law would call for more efficient use of gear, give lobsters a better chance of attaining maximum size, and, conceivably, promote more research.

6. The area that needs the most improvement is that of communications--between producers and consumers, of course, although this can be handled by a marketing program, but between producers and researchers. Only by keeping up with new methods and trends can those in every segment of the industry ensure that their operation continues to be profitable.

The reviewer states that this thesis (as reflected by the bibliography) is a valuable addition to the limited inventory of research papers dealing with the economics of lobstering. [1 photograph]

2.1121 CLIP LINKS SAVE TIME IN TRAWL CHANGES

Anonymous
World Fishing 18, No. 11, 50 (November 1969)

British trawlers commonly work with two trawls, one in use and the other on deck ready for use if the working one is damaged. During bottom trawling off Greenland, a crew may have to change trawls two or three times a day; large stern trawlers commonly change trawls 40 or 50 times during a normal voyage there. One change normally takes 20 min., thus a large trawler can lose 50 valuable fishing hours a year just changing nets. Since a freezer trawler has an earning potential of over £1,000 a day on the fishing grounds, the loss of fishing time represents a significant loss to the vessel. Thus a saving of only a few minutes during each change would have considerable economic importance.

Small Granton trawls with 60 ft. of 18- or 24-in. bobbins and Lancaster spacers on the footrope are normally used in the Greenland fishery. Three-linked Lancaster chains are secured to the fishing line by manila twine, connecting the bobbin rig to the trawl proper. When the trawl is changed, the crew has to cut the manila connections off, drag the damaged trawl clear, and connect the spare trawl to the ground rope bobbin rig by remaking all the manila connections. Most of the time they spend in changing trawls is spent cutting off and remaking the manila connections to the bobbin rig.

The Industrial Development Unit of the White Fish Authority suggested that a considerable amount of time could be saved if a spring-loaded clip link were substituted for the middle link of the Lancaster chain. All the crew would have

(over)

 Abstracter: L. Baldwin

2.1126 INCREASING THE EFFICIENCY OF GILL NETS

Gorman, T. B.
The Fisherman 3, No. 5, 12-15 (June 1969)

New South Wales' State Fisheries has purchased a number of nets for research purposes. This article discusses, with tables and illustrations, the introduction of vertical slack into the webbing, showing how to calculate the hanging coefficient and its reciprocal, the percentage of slack hung in; the addition of vertical hobbles (those threaded through the meshes, those running down one side of the netting, and those running down both sides) and oblique hobbles; and the construction and advantages of framed gill nets and two- and three-walled trammel nets. In addition to discussing alterations of the basic design of gill nets, the author encourages fishermen to take advantage of such recent developments in gear technology as tanglefree corklines and leadlines, which contain their own buoyancy or weight as an integral part of their construction. Results of the fisheries agency's tests on the performance of nets incorporating these lines have been quite encouraging. Details about the equipment are available from N.S.W. State Fisheries, Box 30, G.P.O., Sydney, 2001, Australia.
[7 figures, 2 tables, 1 reference]

 Abstracter: L. Baldwin

2.1126 SOME EFFECTS OF SHAPE AND STRUCTURE OF FISH ON SELECTIVITY OF GILLNETS

McCombie, A. M., and A. H. Berst (Ontario Department of Lands and Forests Research Branch, Maple, Ontario, Canada)
Journal of the Fisheries Research Board of Canada 26, No. 10, 2681-2689 (October 1969)

Information on the selectivity of gill nets is needed as a basis for measuring efficiency of the fishing gear and for management purposes. Most selectivity data curves have been based on the length of fish because this dimension is most easily and most often measured. In the present work, the authors used girth measurements in order to determine the relation between selectivity and fit of the fish to the mesh of the net.

Selectivity curves were prepared for three species of fish taken in South Bay, Manitoulin Island, and in Georgian Bay during 1954-59 with gangs of nylon gill nets. The curves differed with respect ot mode, skew, and kurtosis. A graphic method was developed to describe one aspect of body shape (the relation between girth and distance from the snout) that would affect selectivity. The shapes of mature and immature perch and suckers of both sexes could be described from the same curve. Differences in body shape did not account for differences in selectivity of these species. The taper for the gravid female perch was different from that for the nongravid.

Most of the fish were caught on the opercle or near the position of maximum girth. Accordingly, these factors accounted for most of the skew in the selectivity curves based on maximum girth.

(over)

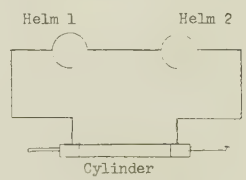
 Abstracter: F. T. Piskur

2.114 HYDRAULIC STEERING SYSTEM ON FISHING VESSELS

Wood, Ray A. (Capilano Engineering Co. Ltd., 1675 West 2nd Avenue, Vancouver 9, British Columbia, Canada)
Western Fisheries 79, No. 2, 44-48, 50-51 (November 1969)

Although all modern fishing vessels have hydraulic steering systems, few fishermen fully understand how they work. This article explains the operation, advantages, and disadvantages of the basic types of such systems. In the main, these systems consist of a hydraulic pump, which is connected to the wheel, and a slave cylinder, which is connected to the rudder. Turning the wheel pumps oil from one side of the cylinder to the other, causing the rudder to move. When a vessel has more than one helm, two or more pumps are used, one at each wheel. These extra pumps are connected either in series or in parallel.

A series-connected hydraulic steering system is shown on the right. Turning helm 1 draws oil from one side of the cylinder, pumps it through helm 2 (causing it to turn), and then into the other side of the cylinder, moving the cylinder rod and causing the rudder to turn. The author cautions against buying such a system for three principal reasons: (1) much of the effort put into turning the first wheel is lost in the unnecessary rotation of the second, (2) any pressure on the rudder causes the helms to turn, and (3) inadequate provisions for purging air from the system makes it unresponsive.



(over)

 Abstracter: L. Baldwin

2.1126

The selectivity curves (plotted on the basis of girth where caught) showed that efficiency of capture was maximal when the girth was 1.0 to .12 times as great as the perimeter of the mesh--for most of the fish captured, the girth at the position of capture was equal to, or slightly greater than, the perimeter of the mesh. Very few fish were captured when the girth/perimeter ratio was less than 0.8 or 0.9. No perch or suckers were taken when the girth/perimeter ratios were greater than 1.5, and less than 5 percent of the round whitefish were taken at a ratio of 1.6--the efficiency of capture declines rapidly at ratios greater than 1.2. [5 figures, 27 references]

2.1125 DESIGNING AN IMPROVED CALIFORNIA TUNA PURSE SEINE

Ben-Yami, M'nakhen (Department of Fisheries, Sea Fisheries Research Station, Haifa, Israel), and Roger E. Green (Bureau of Commercial Fisheries, Fishery-Oceanography Center, P.O. Box 271, La Jolla, California 92037)
Fishery Industrial Research 4, No. 5, 183-207 (December 1968)

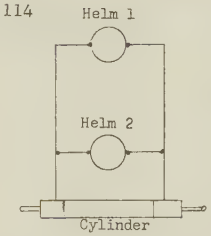
In the Eastern Tropical Pacific Ocean, about 50 percent of the purse seine sets for tuna are unsuccessful, owing mostly to the fish's escaping the net during setting and pursing operations. Described here is the design of a proposed purse seine that will largely retain the desirable features of the presently used seine but that will sink faster and use the webbing with greater economy. In comparative tests with scale models (1:25), the model built according to the proposed design sank nearly three times as fast as did the model of the presently used seine. [16 figures, 5 tables, 40 references] [Authors' abstract]

2.1121

to do when changing trawls would be to unclip the bobbin rig from the damaged trawl and clip it to the spare trawl, which would have single links already attached to the fishing line in the correct position. All the spare trawls could be correctly rigged on shore or during the run to the fishing grounds. Two types of spring-loaded clips were chosen for trial, both the heavy-duty, karabiner type used by climbers. One was of carbon steel that was very strong; however, its spring began to deteriorate after prolonged use. The other was of chrome steel that worked perfectly; however, the size of link was not strong enough to bear the loads imposed, so it tended to distort. The manufacturer of the first is modifying the spring for use in sea water, and the manufacturer of the second is submitting a larger model for trial.

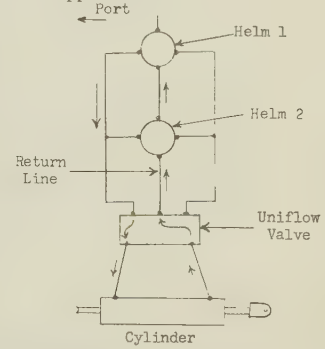
Despite first-trial problems, the principle proved to be sound. The time to change trawls was reduced from 20 min. to 11 min. This reduction in time may herald the day when the British distant-water fleet will no longer rely almost exclusively on the small Granton trawl; rather, each vessel will carry several different trawls, the appropriate one being chosen to fit existing fishing conditions. Researchers in the Industrial Development Unit believe that on all types of fishing vessels clip links could be used instead of many of the light-weight, high-strength shackles, hooks, and chains. A set of the clips will probably cost about £15 per trawl, a cost that most likely will be recouped by the saving in manila twine alone. [2 photographs]

2.114



On the left is a sketch of a parallel-connected hydraulic steering system. All good modern steering systems are of this type, the author says, so he describes the operation in detail, indicating the features that make these systems more advantageous than series-connected systems. However, they have five serious disadvantages: they are difficult to purge of air; usually no provision is made to protect them from pressure build-ups caused by sudden overloads on the rudder or by increases in temperature; helm pumps are subject to air lock; dirt in the system is hard to locate; and control of the vessel is lost if two helms are rated in opposite directions.

To overcome these serious disadvantages, a simplified parallel system has been developed (see sketch on the right). It has only one lock valve (called the Uniflow valve) in the entire system, as opposed to one per helm in conventional systems, and is protected against rudder shocks and temperature expansion by relief valves. It can be purged of air as fast as it can be filled with oil. (As shown by the unlabeled arrows in the sketch, oil in the lines always flows in only one direction, so any air in the system can escape directly to atmosphere from the pump reservoir.) No helm can become air locked, no matter where it is placed, and no two helms can be turned in opposite directions at the same time. Only two checkballs in the system make cleaning simple. [9 figures]



2.1127 SAURY RESOURCE FOR BAIT OF TUNA LONG-LINE FISHERY
(2.1473)(1.12) (THE CATCH RATE AND INJURY RATE ON DRIFT NET)

Han, Hak Soo, and Tae Hyun Jo
Bulletin of Fisheries Research & Development Agency, No. 3, 121-141 (1968)

Although the Koreans produce 30,000 metric tons of saury a year, they have never used this fish for bait in the tuna longline fishery--the fish are caught by net and are usually too badly injured to be useful as tuna bait. As a result, the Koreans who fish for tuna in distant waters have to import their bait. To investigate the possibility of using some of the saury catch for tuna bait, the authors tested the catch rate and the injury rate of saury caught in drift nets made of nylon, polyvinyl alcohol (PVA), and cotton fibers. Of the total catch, the nylon net accounted for 40.9 percent, the PVA net 32.3 percent, and the cotton net 26.8 percent. 58 percent of the saury caught in the nylon net was suitable for bait; 66.1 percent caught in the PVA net was suitable; and 72.4 percent caught in the cotton net was suitable. Thus the relative bait-producing rate of the three nets was nylon, 36.6 percent; PVA, 32.9 percent; and cotton, 30.5 percent. [8 figures, 9 tables, 12 references] [Abstracter: L. Baldwin]

2.3 FISH PROCESSING

German Pending Application 1,429,962
Institut für Schiffbau (pat.)
Food Technology 23, No. 12, 69 (December 1969)

The apparatus, using contrarotating knives, deheads and fillets fish in one operation. [Abstracter: F. T. Piskur]

2.117 CONSULTANT FINDS FERRO-CEMENT HAS LIMITATIONS

Gardner, John
National Fisherman 50, No. 10, 4B, 15B-16B (February 1970)

As introduction, the author quotes a letter written to him by an engineering consultant who has concluded that ferro-cement is not the attractive, profitable ship-building material it is claimed to be. Acting for a client who was interested in the series production of ferro-cement commercial vessels, the consultant surveyed the ferro-cement market and came to the following conclusions: (1) engineering data are few, contradictory, poorly documented, and questionably reliable; (2) many of the designs and vessels not only fail to take advantage of the inherent properties of ferro-cement as a plastic material but are quite unsuited to the presumed qualities of the material; (3) the quality of finished vessels, even those turned out by experienced builders, is very poor, particularly that of the fairness and the surface finish; (4) optimistic statements about ferro-cement construction costs are not borne out by fact--the consultant finds ferro-cement only barely competitive with steel and fiberglass-reinforced plastic; (5) except for those who are also building in other materials or are engaged in other activities, most of the ferro-cement builders are insolvent and have not only no business experience but no boatbuilding or engineering background; (6) there are only two ways to make money from ferro-cement--by franchising others and by writing how-to books.

The consultant assured the author that he believes ferro-cement has great promise. However, before that promise can be realized, a large-scale program of

(over)

 Abstracter: L. Baldwin

2.1471 EXPERTS SPEAK ON: PELAGIC TRAWLING. . .
(2.1475) "FISHERMEN AND RESEARCH" CONFERENCE AT TRONDHEIM

Anonymous
World Fishing 18, No. 11, 44 (November 1969)

This article summarizes one of the talks given at the Trondheim "Fishermen and Research" conference during a day that was of particular interest to practical fishermen. In the talk, FAO gear expert J. Schärfe compared the advantages and disadvantages of pelagic trawling and purse seining. He also gave the advantages and disadvantages of two-boat trawling and single-boat trawling, concluding that, overall, the one-boat system is superior to the two-boat system. In conclusion, he mentioned developments to be made in the future: an acoustic beacon on the net to permit the skipper to take an accurate bearing of the net in relation to the ship; a transducer on the square to permit him to monitor the fish actually entering the cod end (thus, if more than 80 tons of fish were seen there, some could be released before hauling); a current meter on the trawl to show actual trawl speed--not trawling speed; use of the pelagic trawl for catching such untapped resources as krill and plankton; a combination high-headline trawl capable of demersal as well as pelagic trawling--in some cases an acceptable alternative to purse seining.

 Abstracter: L. Baldwin

2.143 SHRIMP-BEHAVIOR STUDIES UNDERLYING THE DEVELOPMENT
(1.85)(2.1121) OF THE ELECTRIC SHRIMP-TRAWL SYSTEM

Klima, Edward F. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi 39567)
Fishery Industrial Research 4, No. 5, 165-181 (December 1969)

Observation of how shrimp react to different amounts of electrical energy and repetition rates of pulsating direct current in the laboratory and the field provided information on the electric characteristics needed for an effective electric shrimp trawl.

The laboratory studies showed the electric threshold voltage of shrimp oriented at different positions to the electrodes and the effect of different voltages on the shrimp's responses. Threshold voltages were affected by the animal's position relative to the electric field, and the shrimp's reaction increased with an increase in voltage.

The field studies provided information on the electrical output needed to force burrowed shrimp out of the substrate. Capacitor-discharge pulses of 4 per second with a potential of 3.0 volts or more across 100 millimeters parallel to the electric field were best for forcing shrimp out of the types of bottom on some of the commercial shrimping grounds in the Eastern Gulf of Mexico.
[16 figures, 9 tables, 6 references]

 Author's abstract

3.12 EFFECT OF EDTA TREATMENT ON SPOILAGE CHARACTERISTICS
OF PETRALE SOLE AND OCEAN PERCH FILLETS

Pelroy, Gretchen A., and John P. Seman, Jr. (U.S. Bureau of Commercial Fisheries, Technological Laboratory, Seattle, Washington 98102)
Journal of the Fisheries Research Board of Canada 26, No. 10, 2651-2657 (October 1969)

Earlier workers have shown that fish fillets dipped in dilute solutions of various sodium salts of ethylenediaminetetraacetic acid (EDTA) show a greater chill storage life than undipped fillets do. The present paper reports on the storage life characteristics of fish fillets treated with Na_2EDTA; $Na_2CaEDTA$, and Na_4EDTA. Fillets of Pacific ocean perch (Sebastodes alutus) were dipped in a 1 percent solution of Na_2EDTA, Na_4EDTA, and $Na_2CaEDTA$ and sealed, with and without vacuum, in laminated mylar-polyethylene bags. Fillets of petrale sole (Eopsetta jordani) were dipped in a 1 percent solution of Na_4EDTA and packed in polyethylene (oxygen-permeable) bags and in laminated mylar-polyethylene (oxygen-impermeable) bags. The mylar-polyethylene bags were vacuum sealed. Storage temperature was 0.5° C.

Treatment of Pacific ocean perch and petrale sole fillets with salts of EDTA extended the shelf life of the fillets stored at 0.5° C. and repressed the growth of Pseudomonas spoilage organisms and the formation of trimethylamine. Na_2EDTA and Na_4EDTA extended the storage life of Pacific ocean perch fillets by 7 to 10 days; $Na_2CaEDTA$ extended the storage life by 4 days. Vacuum packaging the fillets was additionally effective in prolonging the storage life of the treated fillets.
[1 figure, 2 tables, 11 references]

 Abstracter: F. T. Piskur

2.12 BOTTOM TRAWL EXPLORATIONS IN NORTHERN LAKE MICHIGAN, 1963-65
(1.0118)

Reigle, Norman J., Jr. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Ann Arbor, Michigan 48103)
Circular 318, iii + 21 pp. (September 1969) (U.S. Department of the Interior, U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C. 20240)

Over a period of 3 years the Bureau of Commercial Fisheries Exploratory Fishing Base at Ann Arbor, Mich., surveyed the relative abundance, depth distribution, and seasonal availability of various fish stocks that were fished with bottom trawls.

The alewife, Alosa pseudoharengus, and chubs, Leucichthys spp., were taken readily with the bottom trawl, Alewives composed 48 percent and chubs 42 percent of the total trawl catch. Three other fish--smelt, Osmerus mordax, suckers, Catostomus commersoni and C. catostomus, and common whitefish, Coregonus clupeaformis--were taken occasionally in commercial amounts.

Alewives have very pronounced seasonal movements, and at certain times of the year bottom trawls catch them only at specific depths. Bottom trawls did not take alewives in commercial amounts during all periods fished; there is evidence that alewives would be available commercially only in certain seasons. Chubs were caught readily throughout the study, although they too appeared to be taken in greater quantities at certain times. Bottom trawling indicated some horizontal dispersal of both alewife and chubs shoreward in summer and back to deeper water in fall. Chubs are caught over a wide depth range throughout the year.
[6 figures, 22 tables, 2 references] [Author's abstract]

3.9 MEAT CHIP--A NEW SNACK IDEA
(3.2349)

Fox, J. B., Jr., and S. A. Ackerman (USDA, Eastern Utilization Research and Development Division, 600 E. Mermaid Lane, Philadelphia, Pennsylvania 19118)
Food Technology 24, No. 1, 34, 36-37 (January 1970)

Meat Chip snacks were prepared from freeze-dried beef, pork, lamb, chicken, turkey, and shrimp. The best product was prepared from meat sliced about 0.053 in. thick. The slices were freeze-dried, then deep-fat fried at 160° C. for 15 sec. The combination of freeze-drying and deep-fat frying produced a tender, crisp, stable, and sturdy snack product. Meat chips packed in airtight aluminum foil packages kept well for 1 month. Production of chips from fish [species not specified] was not successful--the freeze-dried slices of fish were fragile and broke apart during frying. [2 tables] [Abstracter: F. T. Piskur]

3.2349 FREEZE-DRIED MEATS

U.S. Patent 3,459,561
Mook, D. E., and P. L. Roberts; Borden Inc. (pat.)
Food Technology 23, No. 12, 69 (December 1969)

Freeze-dried meat products are sprayed with an antioxidant to combat rancidity.
[Abstracter: F. T. Piskur]

2.117

research and development must be completed. Most of the research so far has come from the universities, the University of Michigan in particular having made extensive contributions. The Department of Naval Architecture and Marine Engineering (in Ann Arbor) has issued the following substantial reports:

"Ferro-Cement Trawler Design Report" (1968), by Coleman and Jergovich.
"Ferro-Cement, With Particular Reference to Marine Applications" (March 1969), by C. D. Canby.
"Analysis of Ferro-Cement in Bending" (December 1969), by H. F. Muhlert.
[3 photographs]

2.15 EFFECT OF SEAWATER CHILLING ON LANDED QUALITY OF SCALLOP MEAT

Varga, S., and C. M. Blackwood (Department of Fisheries and Forestry of Canada Fish Inspection Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 26, No. 9, 2523-2526 (September 1969)

Aboard vessels fishing for scallop (Placopecten magellanicus Gmelin), shucked scallop meats are packed in 35- to 40-pound bags and stored below in ice. The time required for the scallop meat at the center of the bag to cool to 32° F. is from 18 to 36 hours, depending upon the initial temperature of the meats. Canadian vessels, fishing in certain areas during the summer and fall when ambient temperatures were relatively high, had landed significant quantities of poor quality scallop meats. The present authors believed that chilling of the scallop meats prior to bagging would solve the quality problem. They carried out two shipboard tests using refrigerated sea water. The landed quality of scallop was improved by chilling the meat in the refrigerated sea water prior to bagging and icing. The results suggest that the storage time of bagged scallop meats kept in the ice could be increased by 2 to 9 days.
[1 figure, 8 references] [Abstracter: F. T. Piskur]

2.3 SCALLOP PROCESSING
(1.84)

U.S. Patent 3,465,382
Meyer, L. (pat.)
Food Technology 24, No. 1, 48 (January 1970)

The scallops are carried on a conveyor and exposed to jets of steam. The meats are separated from the loosened shells on a sloping agitating screen.
[Abstracter: F. T. Piskur]

2.1471 OTTER TRAWLING INTRODUCED TO COLUMBIA RIVER SMELT FISHERY.
(1.26)(1.0113) A PROGRESS REPORT

Ellis, Ian E. (Bureau of Commercial Fisheries, Exploratory Fishing and Gear Research Base, Seattle, Washington 98102), and Clint Stockley (Columbia River Fisheries Management, Vancouver Laboratory, Washington Department of Fisheries, 1408 Franklin Street, Vancouver 98660)
Commercial Fisheries Review 32, No. 1, 51-60 (January 1970) (Separate No. 862)

An otter trawl net was test fished in the Columbia River to catch eulachon. Limited commercial trawling caught about three times as many eulachons per day as gill netting did during the same period. Trawl gear costs less than gill nets and produces higher quality fish with less effort.
[6 figures, 4 tables, 4 references] [Authors' abstract]

3.239 GLYCOLYTIC AND NUCLEOTIDE CHANGES IN THE CRITICAL FREEZING ZONE, -0.8 to -0.5 C, IN PRERIGOR COD MUSCLE FROZEN AT VARIOUS RATES

Nowlan, Sandra S., and W. J. Dyer (Fisheries Research Board of Canada Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 26, No. 10, 2621-2632 (October 1969)

With the advent of freezing fish at sea and the development of large freezer-trawlers, interest has increased in the freezing of fish in prerigor condition. Extensive work has been carried out on postmortem changes in the muscle of cod leading to the development of rigor, but little work has been done on the changes that occur in prerigor cod muscle during the freezing process. The object of this study was to elucidate the relation between the postmortem biochemical reactions that occur in cod muscle during freezing and the time taken to pass through the critical temperature range (-1° to -5° C.). Data were obtained on (1) the extent of glycolysis and related reactions at different freezing rates through the critical freezing zone and spanning the range found in commercial practice and (2) the pattern of glycogenolysis and of nucleotide catabolism during slow freezing in the critical zone from -0.8° to -5° C. as compared to that pattern found in unfrozen muscle held at 0° C. For these tests, the cod muscle was frozen in such a way that cooling was as uniform as possible throughout the sample. The actual sample was 1 cm. thick in the center of a 2.8-cm. thick pack.

Significant changes occurred during freezing as the samples cooled through the critical temperature zone from -0.8° to -5° C., but little further change

(over)

 Abstracter: F. T. Piskur

3.64 (3.2349) EFFECT OF OXYGEN UPTAKE ON QUALITY OF COOKED, FREEZE-DRIED COMBINATION FOODS

Tuomy, J. M., L. C. Hinnergardt, and R. L. Helmer (Food Laboratory, U.S. Army Natick Laboratories, Natick, Massachusetts 01760)
Journal of Agricultural and Food Chemistry 17, No. 6, 1360-1363 (November-December 1969)

The quality of certain freeze-dried foods (including fish) decreases when they are stored in oxygen or air. The purpose of this study was to test the oxygen uptake and the resultant organoleptic ratings of eight freeze-dried combination foods used in military operational rations. The rations are similar to some contemplated for the commercial market. Those tested were: beef hash, beef stew, beef with rice, chicken and rice, chicken stew, chili con carne, pork with potatoes, and spaghetti with meat sauce. The products were packed in cans at vacuums of 30, 28, 26, 24, 22, 20, and 0 inches. The samples were stored at 100° F. Evaluations (organoleptic ratings, rehydration values, and analysis of headspace gas) were made at periodic intervals during a 6-month storage period.

Flavor and odor ratings showed high positive statistical correlation with oxygen uptake. Rehydration ratio values did not correlate with oxygen uptake of the freeze-dried foods. Certain items (beef and rice, and chili con carne) exhibited antioxidant properties.

[5 tables, 14 references]

 Abstracter: F. T. Piskur

3.2495 REACTION OF FREE FATTY ACIDS WITH PROTEIN IN COD MUSCLE FROZEN AND STORED AT -29 C AFTER AGING IN ICE

Anderson, Margaret L., and Elinor M. Ravesi (U.S. Bureau of Commercial Fisheries, Technological Laboratory, Gloucester, Massachusetts)
Journal of the Fisheries Research Board of Canada 26, No. 10, 2727-2736 (October 1969)

In previous work (1968), the present authors established that (1) decrease in the amount of protein extractable in cod muscle aged in ice is due to an association process involving the formation of a contractile protein-FFA (free fatty acid) complex and (2) decrease in the extractability of the protein in the muscle is small even in the presence of large amounts of FFA because the complexes are not stable and dissociation occurs during the extraction. They suggest that acceleration of the reaction and stabilization of the reaction products in the frozen state may account for the larger decreases in extractability of protein that have occurred in frozen-stored muscle of similar FFA content. In this present study, the authors attempted to separate the effects of holding in the frozen state from the effect of FFA liberation by producing muscle of various FFA contents by aging it in ice for different lengths of time, and then aging it further in the frozen state at a temperature so low that little additional hydrolysis of the lipid would be expected. In this way, they could determine the roles that freezing and holding in the frozen state play in bringing together the reactants, FFA and contractile protein, through following changes in (1) protein extractability, (2) composition of protein extracted as viewed in ultracentrifugal patterns

(over)

 Abstracter: F. T. Piskur

4.11 MASS SPECTROMETRIC ANALYSIS OF LONG-CHAIN ESTERS OF DIOLS

Baumann, W. J., J. Seufert, H. W. Hayes, and R. T. Holman (University of Minnesota, The Hormel Institute, Austin 55912)
Journal of Lipid Research 10, No. 6, 703-709 (November 1969)

Diol lipids (lipids in which the short-chain moieties are diols rather than glycerol) apparently occur in minor amounts in a large variety of plant and animal tissues and in microorganisms. Previous workers have demonstrated that ethanediol, propanediols, butanediols, and other dihydric alcohols are present in hydrolysates of neutral lipid fractions and that they are derived from long-chain monoesters, diesters, and alk-1-enyl ether esters. Also, the physical characteristics of the diol lipids are similar to those of the corresponding glycerol-derived lipids. Therefore, methods are needed for the identification, distinction, and analysis of the naturally occurring diol lipids.

The present study involved the evaluation of mass spectrometry for identifying and characterizing individual monoesters and diesters of various short-chain diols, for identifying pure classes of these compounds independent of chain length and degree of unsaturation of their aliphatic moieties, and for analyzing mixtures of diol lipids derived from different diols. The paper describes and interprets mass spectra of monoesters and diesters of ethanediol, 1,3-propanediol, 1,4-butanediol, and 2,3-butanediol. Mass spectra of homologous series of synthetic long-chain monoesters and diesters of 1,2-ethanediol are reported, and the general patterns of fragmentation are established. The work demonstrated that mass spectrometry is suitable for the identification, distinction, and analysis of diol lipids. [2 figures, 2 tables, 26 references]

 Abstracter: F. T. Piskur

3.2495

of the extracts, and (3) phase contrast micrographs of inextractable muscle fragments.

The authors found that freezing and holding cod muscle in the frozen state favored the association process that involves formation of a protein-FFA complex and begins during aging of the muscle in ice. Changes in protein extractability, in ultracentrifugal patterns of the proteins extracted, and in phase contrast micrographs of inextractable muscle fragments were followed in cod muscle that had been aged in ice to produce various contents of FFA and then were frozen and held at -29° C. Comparison of the content of extractable protein of cod muscle held in the frozen state for 11 months after aging in ice for various periods with the FFA contents of this muscle revealed that decreases in the amount of extractable protein were comparable with those that occur when the FFAs are formed during frozen storage. Loss in soluble protein in cod muscle during storage in ice increases with storage time, and loss in soluble protein in frozen cod muscle increases with the time the fish were stored in ice prior to being frozen. It is clear, then, that only prime quality fish should be used for freezing if maximum frozen storage life is desired. [9 figures, 1 table, 23 references]

3.2342 SHRIMP FREEZING

(1.85)

Canadian Patent 822,903

Grimes, E. L.; Marine Construction & Design Co. (pat.)

Food Technology 24, No. 1, 48 (January 1970)

The shrimp are immersed in a shallow bath of coolant that moves through a channel. Jets of coolant submerge any shrimp that may tend to surface, thus effecting an even distribution of shrimp in the coolant. [Abstracter: F. T. Piskur]

3.239

occurred after the temperature had fallen below -5° C. The extent of the changes depended upon the so-called thermal arrest time (TAT) (that is, the time required for the sample to pass through the critical freezing zone of from -0.8° to -5° C.). During rapid freezing (TAT of 0.22 hr.), the most significant change in the muscle was a 39 percent dephosphorylation of creatine phosphate; small amounts of glycogen and acid-labile phosphorus were lost. During an intermediate rate of freezing (TAT of 5.4 hr.), the muscle lost one-half of its initial glycogen and almost all of its creatine phosphate; also about one-third of the initial content of ATP (adenosine triphosphate) was converted to IMP (inosine monophosphate). During slow freezing (TAT of 20 hr.), the muscle contained only traces of glycogen and high energy phosphorous compounds.

Dephosphorylation of creatine phosphate and degradation of ATP to IMP occurred more rapidly in cod muscle at -1° C. in the process of freezing than in unfrozen muscle held at 0° C. The rate of glycogen loss in the partially frozen muscle at -1° C. was similar to that in the unfrozen muscle at 0° C.; however, there was an increase in the rate as the temperature dropped below -1° C.

It appears, then, under commercial processing conditions aboard a freezer-trawler that, when the TAT is short, biochemical changes during freezing are trivial so that frozen prerigor muscle may retain sufficient ATP and glycogen to support thaw rigor. If large, thick samples are frozen and the TAT is prolonged to several hours, the biochemical changes will be extensive and the fish muscle may no longer be in prerigor condition by the time it is frozen.
[8 figures, 2 tables, 27 references]

4.11 SEPARATION OF NEUTRAL LIPIDS OF SHARK LIVER BY "DRY-COLUMN" CHROMATOGRAPHY

Casey, Andria C. (New England Institute for Medical Research, Ridgefield, Connecticut 06877)
Journal of Lipid Research 10, No. 4, 456-459 (July 1969)

Thin-layer chromatography (TLC) has been used to separate neutral lipids into classes but, even with preparative techniques, the amount of material that can be separated by TLC is limited. A column chromatographic technique termed "dry-column" chromatography appears to afford separations on a preparative scale that are comparable to those obtained by TLC. In the dry-column chromatographic method, a glass, quartz, or nylon column is loaded with dry absorbent, the mixture to be separated is deposited on the top of the absorbent, the solvent is added and allowed to move down the column. When the front of the solvent reaches the bottom of the column, chromatography is stopped. Positions of the bands are determined by visual examination, by trial and error, or by knowledge of the R_f values of the expected bands. The column is extruded or is cut at the appropriate places and the materials are extracted with solvents.

The present paper describes the separation of neutral lipids extracted from shark liver by means of dry-column chromatography. A mixed solvent system was used and an essential feature of the technique was the equilibration of the absorbent with the solvent mixture prior to use.

The author successfully separated gram quantities of neutral lipids from shark liver oil into simple fractions using the dry-column chromatography technique in a mixed solvent system. The technique will handle several grams of sample and, in addition, is rapid and gives reproducible results.
[2 figures, 13 references] [Abstracter: F. T. Piskur]

3.4 VOLATILE COMPONENTS OF HARDWOOD SAWDUST SMOKE COMPONENTS OF PHENOLIC FRACTION

Lustre, A. O., and Phillip Issenberg (Department of Nutrition and Food Science, Massachusetts Institute of Technology, Cambridge 02139)
Journal of Agricultural and Food Chemistry 17, No. 6, 1387-1393 (November-December 1969)

Wood smoke consists of a complex system of vapor and particulate phases. Foods exposed to wood smoke absorb varying amounts of the smoke components depending upon the absorbing surface and the solubility of the individual components of the smoke in the water, fat, and other food constituents. Chemical reactions may also take place between smoke components and food constituents. The object of the present study was to determine the composition of the phenolic fraction of hardwood sawdust smoke as the first part of a greater study of the interactions between smoke components and foods.

The compounds of the phenolic fraction were separated by gas chromatography and identified by mass spectrum determinations and infrared analysis. The presence of 2-methoxy-4-allylphenol, 4-hydroxy-3,5-dimethoxybenzaldehyde, and all three isomeric methoxyphenols in the phenolic fraction was confirmed. Compounds identified that had not been previously reported were: o-hydroxybenzaldehyde; 3-hydroxy-2-methylpyrone; 2-methoxy-4-cis-propenylphenol; 2-methoxy-4-trans-propenylphenol; 2,6-dimethoxy-4-vinylphenol; 2,6-dimethoxy-4-allylphenol; 2,6-dimethoxy-4-cis-propenylphenol; 4′-hydroxy-3′,5′-dimethoxyacetophenone; 3-(4′hydroxy-3′-methoxyphenyl)-2-propenal; 4′-hydroxy-3′,5′-dimethoxypropiophenone; and 3-(4′-hydroxy-3′,5′-dimethoxyphenyl) 2-propenal. The phenolic fractions of condensates prepared from mixed hardwood sawdust and from hickory sawdust smoke contained the same compounds.
[5 figures, 2 tables, 27 references] [Abstracter: F. T. Piskur]

4.11 (0.118) DTA FOR QUALITY CONTROL OF OILS AND FATS

Anonymous
Food Manufacture 44, No. 12, 61 (December 1969)

DTA, differential thermal analysis, may be used to study the behavior of edible oils and fats in food products. It has been found particularly useful for quality control and, in some cases, for the detection of adulterants. By this method, changes in energy of the material as a function of temperature are measured. The measurement is made by the continuous monitoring of the temperature difference between a sample and a thermally inert reference material during a program of controlled heating or cooling. During differential thermal analysis, fats, for example, will exhibit individual characteristics by which they can be identified and their different forms established. Some applications of DTA to the food industry are: (1) the control of interesterified fats in the formation by chemical reaction of new arrangements of glycerides, (2) development of new fractionating procedures for palm kernel oil, (3) the monitoring of the process for winterizing cod-liver oil, (4) determination of adulterants in cocoa butter, and (5) grading of olive oils. [1 photograph]

4.5 EFFECT OF HEMATIN COMPOUNDS ON THE DEVELOPMENT OF RANCIDITY IN MUSCLE OF COD, FLOUNDER, SCALLOPS, AND LOBSTER

Castell, C. H., and D. M. Bishop (Fisheries Research Board of Canada, Halifax Laboratory, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 26, No. 9, 2299-2309 (September 1969)

Castell and Spears (1968) showed that there were wide differences in the susceptibility of the muscle from different species of fish and other marine animals to randidity induced by the addition of heavy metals. The present paper reports on the effect of adding various amounts of hemoglobin, myoglobin, and catalase to muscle from cod, flounder, scallops, and lobster in inducing rancidity. The relative effect of these organic iron catalysts, and of inorganic iron catalyst, was determined by measurement of the malonaldehyde values and by organoleptic judgment of rancid odors.

Hemoglobin and catalase were very active catalysts of lipid oxidation when added to blended muscle tissue from cod, flounder, and scallops; myoglobin had little or no effect on the development of rancidity in the blended fish muscles. The scallop muscle was slightly more susceptible to hemoglobin-induced rancidity than muscle from cod or flounder; the lobster muscle was highly resistant. The odors accompanying development of rancidity after the addition of free Fe^{++} were different from those arising after the addition of hemoglobin-bound Fe^{++}. After the addition of hematin compounds, the initial development of "metallic," "saltfish," or "seaweedy" odors was less pronounced than when free Fe^{++} was added. The

(over)

4.15 (4.14) HYDROCARBONS OF DOGFISH AND COD LIVERS AND HERRING OIL

Gershbein, Leon L., and Eric J. Singh (Biochemical Research Laboratories, Northwest Institute for Medical Research, Chicago, Illinois 60634)
Journal of the American Oil Chemists' Society 46, No. 10, 554-557 (October 1969)

In earlier work (1969), the authors determined the composition of hydrocarbons and alcohols of the liver oil of the basking shark, and the data obtained were compared with data on the corresponding lipids of the pig. The oil contains pristane and squalene and, in addition, 420 to 750 mg. percent of other hydrocarbons with carbon numbers ranging from 15 to 38. The present work extended the previous studies to other fish oils to demonstrate paraffinic hydrocarbon types. Oils from the liver of the dogfish (Squalus acanthias), the liver of the cod (Gadus morhua), and the whole herring (Clupea harengus) were saponified; the hydrocarbons of the unsaponifiable portion (UNS) were concentrated by chromatography over alumina; and the paraffinic mixtures were obtained by treatment with silica gel. Temperature-programmed gas chromatography was used for the analysis of hydrocarbons of C_{14} to $C_{32.5}$. The results are summarized as follows:

(over)

5.2 (8.64) PROTECTIVE EFFECT OF CASEIN ON CLEAVAGE OF THIAMINE BY SULFITE

Leichter, Joseph, and M. A. Joslyn (Department of Nutritional Sciences, University of California, Berkeley 94720)
Journal of Agricultural and Food Chemistry 17, No. 6, 1355-1359 (November-December 1969)

Sulfite is reasonably effective in preventing the browning reaction, but it can also split thiamine into biologically inactive compounds. In a previous study (1968), the present authors showed that casein exerts a protective effect on the cleavage of thiamine by sulfite. The purpose of the present study was to determine the nature of the protective effect of casein.

They noted that casein catalyzed the oxidation of sulfite by oxygen. Although the splitting of casein disulfite bonds by sulfite was considered to be a factor, the addition of cystine did not protect thiamine against cleavage by sulfite. Because soluble starch had a highly protective effect on thiamine cleavage, the authors believe that some macromolecular property, such as an interfacial surface effect, is involved in the protective effect. Neither thiamine nor sulfite combined with casein in appreciable concentrations under the conditions used. Sulfited casein cleavage of thiamine is water dependent.
[8 figures, 3 tables, 15 references]

4.15

Source of marine oil	Hydrocarbon composition							
	Pristane		Other saturated members		Squalene		Additional homologs	
	In UNS[1]/	In Oil[2]/	In UNS[1]/	In Oil[2]/	In UNS[1]/	In Oil[2]/	In UNS[1]/	In Oil[2]/
	%	mg.%	%	mg.%	%	mg.%	%	mg.%
Dogfish liver	0.193	15.7	0.325	24.8	0.308	23.5	0.200	15.3
Cod liver	0.298	3.0	1.15	11.5	3.29	32.9	2.27	22.7
Whole herring	16.34	221	3.51	47.4	0.992	13.4	1.41	19.1

1/ Unsaponifiable portion.
2/ Dogfish-liver oil yielded 7.62 percent UNS, cod-liver oil, 1.0 percent, and whole herring oil, 1.35 percent.

[3 tables, 16 references]

This process for hydrogenation of oil uses specially prepared copper-chromium-manganese oxide catalysts. [Abstracter: F. T. Piskur]

German Pending Application 1,467,531
Nikki Kagaku K.K. (pat.)
Food Technology 24, No. 1, 85 (January 1970)

6.138 OIL HYDROGENATION

4.12 (1.32) FATTY ACID COMPOSITION OF BRAIN AND BODY PHOSPHOLIPIDS OF THE ANADROMOUS SALMON, ONCORHYNCHUS NERKA, FROM FRESH-WATER AND MARINE HABITAT

Kreps, E. M., M. A. Chebotarëva, and V. N. Akulin (Institute of Evolutionary Physiology and Biochemistry, U.S.S.R.; Academy of Sciences, Leningrad; and Paratunka Experimental Laboratory, Kotinro, Kamchatka, U.S.S.R.)
Comparative Biochemistry and Physiology 31, No. 3, 419-430 (November 1, 1969)

The fatty acid composition of individual phospholipids of brain, muscle, and liver of the following sockeye salmon was studied: (1) adult salmon caught at sea; (2) adult salmon caught during the spawning migration up the river; (3) adult salmon caught in the lake during spawning; (4) 2- and 3-year-old smolt caught in the lake; (5) "resident" fish caught in the lake; and (6) "resident" fish caught during spawning. Fishes (1), (2), and (3) were in the marine stage; salmon (4), (5), and (6) were in the fresh-water stage (they never lived at sea).

The fatty acids of the muscles and liver of fresh-water salmon were about twice as high in linoleic and linolenic acids as were those of the salt-water salmon. In all three phosphoglycerides, the percentage of (18:2 + 18:3) acids was two or three times that of the salt-water salmon. In contrast, the 18:2 and 18:3 acids in the brain were quite similar. The authors conclude that the fundamental role of the phospholipids of the brain cells may be incompatible with fluctuations of the apolar side-chain constituents that largely determine the physicochemical properties of phospholipids.

[4 tables, 30 references] [Abstracter: L. Baldwin]

8.64 (5.4) VITAMIN B_6 COMPONENTS IN SOME MEATS, FISH, DAIRY PRODUCTS, AND COMMERCIAL INFANT FORMULAS

Polansky, Marilyn M., and Edward W. Toepfer (Human Nutrition Research Division, Agricultural Research Service, Beltsville, Maryland 20705)
Journal of Agricultural and Food Chemistry 17, No. 6, 1394-1397 (November-December 1969)

Although vitamin B_6 may be widely distributed in plant and animal tissues, few reliable data are available on the vitamin B_6 composition of foods. Even less information is available in the distribution of pyridoxine, pyridoxal, and pyridoxamine in natural materials. This report presents data on the pyridoxine, pyridoxal, and pyridoxamine values in chromatographed fractions of extracts from 40 meat, fish, dairy product, and commercial infant formula samples. The fish samples consisted of chilled flounder, chilled oysters, frozen shrimp, canned salmon, and canned tuna. Also reported are the total vitamin B_6 values in unchromatographed extracts determined microbiologically and calculated as pyridoxine. Proximate composition data on the foods are included to make it possible to relate the vitamin B_6 data to data from other sources on similar samples. The vitamin B_6 values for the food groups were: meat, from 3 to 8 μg. B_6/g.; fish, from 0.5 to 4; dairy products, from 0.01 to 4; and commercial infant formulas from 0.4 to 4.

[1 table, 15 references] [Abstracter: F. T. Piskur]

6.130 SOLVENT EXTRACTION AND DEHYDRATION OF FAT- AND WATER-CONTAINING TISSUES

British Patent 1,167,673
Blaw-Knox Co. (pat.)
Chemical Abstracts 72, No. 2, 4538r (January 12, 1970)

4.5

most pronounced odors associated with hemoglobin-induced rancidity were the "fish-oil" and "oily-rancid" types usually associated with oxidizing marine oils. Free fatty acids in the fish muscle retarded the development of hemoglobin-induced rancidity. Certain free amino acids, particularly tryptophan and proline, inhibited hemoglobin-induced rancidity; certain others, cysteine and asparagine, were prooxidant; and others, including leucine, phenylalanine, and methionine, had relatively little effect. On the basis of the present and earlier observations with muscle from fish, mollusks, and crustaceans, it would appear that some component of the crustacean muscle may have the power to bind metal ions in such a manner as to leave them unavailable to act as catalysts in the oxidation of lipids.

[9 figures, 2 tables, 23 references]

Agar and aqueous extracts of agar inhibited the hemolytic activity of Sendai virus. During acid hydrolysis, the inhibitory activity was reduced.

[4 tables, 6 references] [Abstracter: L. Baldwin]

6.33 (0.4) ÜBER DEN EINFLUSS VON AGAR UND AGAREXTRAKTEN AUF DAS SENDAIVIRUS. I. HEMMUNG DER HÄMOLYTISCHEN AKTIVITÄT DES SENDAIVIRUS DURCH AGAR UND WÄSSRIGEN AGAREXTRAKT
[INFLUENCE OF AGAR AND AGAR EXTRACTS ON SENDAI VIRUS. I. INHIBITION OF HAEMOLYTIC ACTIVITY OF SENDAI VIRUS BY AGAR AND AQUEOUS AGAR EXTRACT]

Dąbrowski, Waldemar, and Jerzy Andrzejewski (Institute of Microbiology, Medical Academy, Powstańców 72, Szczecin, Poland)
Zeitschrift für Medizinische Mikrobiologie und Immunologie 155, No. 2, 150-155 (1969) (In German, English summary)

6.190 (1.12) NUTRITIVE CONTENT OF TUNA (MIXED SPECIES) FISH MEAL EVALUATED BY CHEMICAL METHODS

Kifer, R. R., N. L. Karrick, W. Clegg, M. E. Stansby, and M. E. Ambrose (Bureau of Commercial Fisheries Technological Laboratory, College Park, Maryland)
Feedstuffs 41, No. 50, 40-42 (December 13, 1969)

The oil content of the four main species of tuna varies appreciably. That of yellowfin and skipjack ranges between 0.7 and 5.0 percent; that of albacore, between 1 and 15 percent; and that of bluefin, between 2 and 12 percent. Most of these data, however, were derived from samples of those parts of the tuna that are canned for human consumption; the parts that are used for tuna meal often have a quite different oil content. So that the tuna meal used in feed formulas can be added in amounts that give maximum results, the authors analyzed the chemical content of two groups of tuna meal. One group, which contained 11 meals, was obtained at intervals between October 1966 and June 1968; these meals may have included raw material from fish other than tuna. The second group, which contained 39 meals, was obtained between 1950 and 1956; these meals were made almost exclusively from tuna-cannery waste.

The meals in Group 1 were tested for proximate composition, for calcium and phosphorus content, for micromineral content, and for amino-acid composition as a percent of the meal and of the protein. The meals in Group 2 were tested for proximate composition and for riboflavin, nicotinic acid, and B_{12} content. Five tables detail the values obtained. A sixth table summarizes the data and includes a column giving the average value of each nutrient decreased by one-half

(over)

Abstracter: L. Baldwin

6.195 COMPARISON OF DIFFERENT TYPES OF FISH MEAL IN PRACTICAL BROILER DIETS

Day, Elbert J., and Ben C. Dilworth (Poultry Science Department, Mississippi State University, State College)
Feedstuffs 42, No. 3, 22, 24, 45 (January 17, 1970)

Although the dietary level of fish meal is generally limited to a maximum of between 10 and 12 percent in broiler diets, it can contribute from 25 to 35 percent of the total protein and from 40 to 50 percent of the total amount of certain essential amino acids in the diet. Thus a knowledge of the variations in protein quality and of the interchangeability of various types of fish meals is important.

To determine the relative protein quality--that is, the interchangeability--of menhaden, Peruvian, and Chilean fish meals, the authors conducted three experiments during which broiler chicks were fed a starter diet from 0 to 5 weeks of age and finisher diets from 5 to 8 weeks of age. They formulated all diets to contain equal levels of lysine and the sulfur amino acids rather than equal levels of protein, assuming that all the fish meals contained identical levels of amino acids when expressed as a percent of the crude protein. All meals were incorporated into the diets at either the 100 percent or the 90 percent amino-acid level (lysine and methionine plus cystine). The levels of fish meal used in all the experiments were rather high, ranging from about 8.5 to 10.0 percent.

In the series of diets containing 100 percent levels of amino acids (which is fairly close to the levels normally used), practically no differences in protein

(over)

Abstracter: L. Baldwin

6.31 (9.19) THERMOPHILIC BLUE-GREEN ALGAE AND THE THERMAL ENVIRONMENT

Castenholz, Richard W. (Department of Biology, University of Oregon, Eugene 97403)
Bacteriological Reviews 33, No. 4, 476-504 (December 1969)

Blooms of planktonic blue-green algae are more frequent, more dense, and longer lasting in waters that are nutrient-enriched. Thermal pollution from the coolant water of power plants (nuclear and conventional) promotes growth of blue-green algae. The habitat suitable for such thermophilic organisms will probably increase substantially in this age of increasing environmental pollution.

Most thermal habitats are aquatic, and the source of heat is telluric (arising from the earth) for most of these habitats. The most abundant aquatic habitats for thermophilic blue-green algae arise from hot springs and their spillways. This paper reviews the current state of knowledge on the thermophilic blue-green algae and the thermal environment. The report contains the following major sections: Distribution of thermal waters, Solutes of thermal waters, Distribution of species, Studies of natural populations, Cultivation of thermophilic cyanophytes, and Responses to temperature and light intensity.
[4 figures, 4 tables, 187 references]

Abstracter: F. T. Piskur

6.54 USE OF FISH PROTEIN CONCENTRATE IN THE DIETS OF WEANLING INFANTS. A STUDY OF 88 INFANTS FROM A LOW SOCIOECONOMIC POPULATION, CASABLANCA, MOROCCO

Tavill, Frederick (Division of Preventive Medicine, Department of Social and Community Medicine, Marquette School of Medicine, 1725 W. Wisconsin Avenue, Milwaukee, Wisconsin 53233), and Alexander Gonik (American Joint Distribution Committee, Geneva, Switzerland)
American Journal of Clinical Nutrition 22, No. 12, 1571-1576 (December 1969)

The authors' purpose in designing the study reported here was to evaluate (1) the methods appropriate to the local feeding habits for incorporating fish protein concentrate (FPC) into the diet of healthy weanling infants; (2) the maximum attainable concentration of FPC in the diet in terms of both infant and mother acceptability; (3) the contribution of FPC towards meeting daily protein requirements; and (4) the infants' gastrointestinal tolerance, height and weight gains, and illness patterns.

Before beginning the nutritional experiments, the authors developed a number of recipes, based on local cereal and vegetable weaning dishes. These dishes, incorporating varying concentrations of FPC, were pretested on small panels of infants and mothers. On the basis of the mothers' reactions to the odor and taste of the formulations (Moroccan FPC has a distinctive odor and taste of fish), they found that a concentration of about 3 percent FPC (w/w) in the food was the maximum level acceptable to the mothers. Then they set up a neighborhood feeding center. The infants used in the experiment were required to attend twice a day

(over)

Abstracter: L. Baldwin

6.195

quality appeared. One Peruvian meal that had given very poor broiler performance at the 90 percent amino-acid level reduced the growth rate only slightly at the 100 percent level. In one experiment, during which the authors used fish meals that had been treated with ethoxyquin, no differences in protein quality appeared even at the 90 percent level. From the results (see table below), the authors draw the following conclusions: (1) when fish meals are properly processed, the amino-acid composition of different meals is quite similar; (2) the most critical dietary amino acids are probably the sulfur amino acids, followed by lysine; (3) suboptimal levels (90 percent) of amino acids should be used in diets designed for studies of protein quality.

Fish meal diet	Feed/gain performance of broilers fed diets containing:					
	90 percent amino-acid levels			100 percent amino-acid levels		
	Exp. 1	Exp. 2	Exp. 3	Exp. 1	Exp. 2	Exp. 3
Menhaden - starter	1.76	1.79	1.92	1.72	1.73	1.81
- finisher	2.13	2.03	2.28	2.09	2.00	2.18
Peruvian - starter	1.80	1.81	1.86	1.71	1.75	1.81
- finisher	2.18	2.20	2.24	2.09	2.08	2.16
Chilean - starter	1.80	1.86	1.85	1.73	1.72	1.77
- finisher	2.17	2.10	2.21	2.10	2.04	2.12

[12 tables, 7 references]

6.190

standard deviation, the handbook value corrected for safety. The table below shows the comparative composition of the two groups of meals.

Constituent	Meal Group	No. of samples	Range High	Range Low	Average	Average decreased by one-half std. dev.
			percent		percent	percent
Protein						
	1	11	59.49	47.14	53.24	51.43
	2	39	67.20	52.50	61.23	58.97
Ash						
	1	11	36.55	19.48	27.52	25.23
	2	16	23.20	17.40	20.31	19.47
Ether fat						
	1	11	12.87	4.85	7.43	6.21
	2	4	4.5	7.2	5.65	(not given)
Total fat						
	1	11	14.97	8.73	11.19	10.24
	2	35	14.30	7.10	10.67	9.71
Moisture						
	1	11	8.72	3.50	6.20	5.43
	2	39	9.60	3.20	6.52	5.65

The authors explain the relatively large differences in the protein and the ash content of the two groups of meals by the change in canning practices that took place between the time each was manufactured. In about 1951, a human market for the red meat began to develop, so meals made after that time gradually contained less and less of the red meat and proportionately more of the head, skeleton, and other waste parts of the carcass. [6 tables, 11 references]

6.54

(except Saturdays and Sundays, when they came only once) for 6 months. In the morning, they were fed a vegetable puree and in the afternoon a meal of cereal.

During the tests, the authors found that the mothers' reactions rather than the infants' limited the amount of FPC that could be incorporated in the diets. Two meals containing a 3-percent concentration of FPC provided slightly more than 10 g. of FPC per day for the infant; this amount plus the vegetable protein in the weaning dishes yielded an equivalent of 13.2 g. of reference protein, 0.6 g. more than is specified in the FAO standard for weanling infants. Weight and length gains for the test infants were compared with those for infants in a control group whose main source of protein was milk. The test infants gained 1.47 kg. and 4.5 cm. between ages 7 and 11 mo.; the control infants gained 1.51 kg. and 4.8 cm. between those ages. These differences were not considered statistically significant (P>0.2). Observations of bowel movements and vomiting attacks revealed no indications of gastrointestinal intolerance to FPC. [4 figures, 8 references]

6.54 SPUN PROTEIN PRODUCT

U.S. Patent 3,468,669
Boyer, R. A., A. A. Schulz, E. A. Schatzman; Ralston Purina (pat.)
Food Technology 24, No. 1, 86 (January 1970)

Spun protein products of improved quality are prepared by treatment with sulfite compounds. [Abstracter: F. T. Piskur]

6.19 THE EFFECT OF HAKE MEAL IN BROILER RATIONS

Arscott, G. H., and David L. Crawford (Departments of Poultry Science and Food Science and Technology, Oregon State University, Corvallis 97331)
Poultry Science 48, No. 3, 1123-1125 (May 1969)

In Commercial Fisheries Abstracts 22, No. 12, 11 (December 1969), the abstract for this article was erroneously headed:

EFFECT OF INTRAMUSCULAR INJECTION OF PENICILLIN
ON BACTERIAL SPOILAGE

Vadehra, D. V., R. C. Baker, and H. B. Naylor (Department of Poultry Science, Cornell University, Ithaca, New York 14850)
Poultry Science 48, No. 3, 1120-1121 (May 1969)

6.138 OIL HYDROGENATION

German Pending Application 1,467,538
Unilever N.V. (pat.)
Food Technology 24, No. 1, 85 (January 1970)

The process selectively hydrogenates oils in the presence of sulfur-containing nickel catalysts. [Abstracter: F. T. Piskur]

6.54 MPC + EDIBLE FAT
(0.6)

Levin, Ezra (VioBin Corporation, Monticello, Illinois 61856)
Food Technology 24, No. 1, 19, 22, 24 (January 1970)

This paper reports on a pilot-plant-scale study of the technical feasibility and the economics of producing meat protein concentrate plus fat (MPC-plus-fat) from animal byproducts by the azeotrophic process. The raw materials from a steer (thyroid removed) consisted of the liver, lung, spleen, heart, stomach, kidney, intestines, blood, and some bone. Similar materials were used from swine. The process uses the azeotrope ethylene dichloride. The dehydrated and defatted material produced by the azeotropic process was extracted with propanol to remove traces of fat and other compounds.

The raw material from the steer weighed 194 lb. and consisted of 133.5 lb. of soft tissue, 39.5 lb. of blood, and 21.0 lb. of bone. The azeotropic process yielded 40 lb. of crude fat (or 20 percent of the total raw material). The final yield of meat protein concentrate (MPC), after isopropanol treatment, was 28 lb. or 14.5 percent.

The raw material from five swine weighed 162 lb. and contained 40 lb. of blood. The azeotropic process yielded 32 lb. of crude fat. The final yield of MPC was 28 lb. or 17.2 percent.

The protein efficiency ratio (PER) for the MPC's was 68 (PER of casein = 100).

The operation should be economically feasible, and the author estimates that plant investment could be retired in 2 years. This projection was based on (1) a

(over)

 Abstracter: F. T. Piskur

7.51 ANAEROBIC REDUCTIVE TITRATIONS WITH SOLID DILUTED SODIUM DITHIONITE IN AN APPARATUS SUITABLE FOR EPR SPECTROSCOPY

Orme-Johnson, W. H., and Helmut Beinert (Institute for Enzyme Research, The University of Wisconsin, 1710 University Avenue, Madison 53706)
Analytical Biochemistry 32, No. 3, 425-435 (December 1969)

Oxidation-reduction titrations are often involved in studies of oxidative enzymes and they must be carried out anaerobically if autoxidizable substances are being investigated. Strong autoxidizable reductants such as sodium dithionite often must be used with proteins of low potential, that is, ferredoxins and other iron-sulfur proteins. Interference from atmospheric and surface-absorbed oxygen becomes troublesome when dilute (<1 mM) reactants are employed. The authors developed a procedure for anaerobic reductive titrations of proteins in conjunction with EPR (electron paramagnetic resonance) and light spectroscopy using sodium dithionite diluted with KCl and small amounts of base. The reductant is kept dry in a sealed glass capsule until deoxygenation of the protein solution is completed. When 1:100 dilution of dithionite was tested with a solution of flavin mononucleotide, the data indicated a titer of 88.6±1.7 (Standard Deviation) nanoequivalents of electrons per milligram; when a 1:300 dilution of dithionite was tested with a solution of cytochrome c, the titer was 23.7±1.2 (S.D.). The first value is 92 percent and the second value is 81 percent of the theoretical values calculated from the $Na_2S_2O_4$ content (85 percent) of the parent dithionite preparation. Apparently the random errors associated with such titrations are commensurate with

(over)

 Abstracter: F. T. Piskur

7.43 (9.19) SPECTROPHOTOMETRIC DETERMINATION OF HYDROGEN SULFIDE IN NATURAL WATERS

Cline, Joel D. (Department of Oceanography, University of Washington, Seattle 98105)
Limnology and Oceanography 14, No. 3, 454-458 (May 1969)

The methylene blue method of determining small concentrations of hydrogen sulfide in water has been widely used since Fischer introduced it in 1883. It is sensitive and specific for sulfide-sulfur, so it is readily adaptable for routine analysis of sulfide-sulfur in sewage and in sea water. However, it can give erratic results. Therefore the author devised a procedure that is applicable to natural waters containing from 1 to 1,000 µg.-atoms/liter sulfide-sulfur (from 0.03 to 32 p.p.m.) and that is free of salt effects and temperature influences. It has the following advantages over the Lauth's violet procedure described by Strickland and Parsons (1968): it uses a single reagent, which contains N,N-dimethyl-p-phenylenediamine sulfate and does not require recrystallization before use; it has superior color and reagent stability at low sulfide concentrations; it is applicable to a wide range of sulfide concentrations; it is about 10 percent more sensitive; and the procedure for standardization is simpler.
[3 figures, 3 tables, 15 references] [Abstracter: L. Baldwin]

 Abstracter: L. Baldwin

7.590 (0.35) A SPIN-LABELED LIPID FOR PROBING BIOLOGICAL MEMBRANES

Waggoner, A. S., T. J. Kingzett, S. Rottschaefer, O. H. Griffith (Department of Chemistry, University of Oregon, Eugene 97403), and A. D. Keith (Genetics Department, University of California, Berkeley 94720)
Chemistry and Physics of Lipids 3, No. 3, 245-253 (September 1969)

Keith, Waggoner, and Griffith (1968) demonstrated that a spin-labeled lipid molecule could be incorporated into phospholipids by a living organism. They obtained an electron spin resonance (ESR) signal from isolated mitochondria of Neurospora crassa grown on a medium containing a spin-labeled lipid. Nitroxide free radicals have become valuable tools for studying biomolecular structure and function; these nitroxides are used as probes because the ESR spectra are sensitive to the mobility of the probe, the polarity of the environment, and the orientation of the probe with respect to the laboratory magnetic field. In the present paper, the authors report the synthesis and properties of spin-labeled lipids and examine their usefulness in probing model membranes.

Two spin-labeled lipids were synthesized in which the nitroxide label was bound to the 12 position of methyl stearate (A) and of stearic acid (B). The spin labels A and B are sufficiently stable for general use in studying biological membranes and model membrane systems. The authors studied, by ESR, the interactions of these new spin labels with sodium dodecyl sulfate and lecithin micellar solutions.

(over)

 Abstracter: F. T. Piskur

7.89 IMPROVEMENT OF DETECTION LIMITS OF FLAME-SPECTROPHOTOMETRIC DETERMINATION OF CHLORINATED ORGANIC PESTICIDE RESIDUES

Herrmann, Roland, and Brigitte Gutsche (Department of Medical Physics, Univ.-Hautklinik, Giessen, West Germany)
Analyst 94, No. 1124, 1033-1035 (November 1969)

In previous papers, the authors showed that Gilbert's indium chloride flame-spectrophotometric method could be adapted to the rapid, specific analysis of chlorinated insecticide residues as a means of controlling quality in foods. In the present paper, they show that the sensitivity of the method, and hence the detection limits, can be improved by modifying the burner so that the indium surface area, which reacts with the chlorine, is enlarged. By using a spectrophotometer, they obtained a detection limit of 0.021 µg. of lindane (corresponding to a concentration of 0.014 µg. of chlorine); the detection limit with the previous burner was 0.23 µg. of lindane. Using a filter photometer, they obtained a detection limit of 0.022 µg. of lindane; with the previous burner, the limit was 0.086 µg. of lindane. The reproducibility of the method was unaffected by the modification.
[1 figure, 5 references] [Abstracter: L. Baldwin]

7.51

those encountered with EPR spectroscopy. The mechanical process used in these experiments may have many other applications where small amounts of a substance must be introduced at the appropriate time into a closed space.
[3 figures, 21 references]

6.32 GLUTAMATE DEHYDROGENASE OF CHLORELLA

Shatilov, V. R., Z. G. Evstigneeva, and V. L. Kretovich (A. N. Bakh Institute of Biochemistry, Academy of Sciences of the U.S.S.R., Moscow)
Biochemistry 34, No. 2, Part 2, 327-332 (March-April 1969) (Translated from Russian)

The authors obtained highly purified samples of glutamate dehydrogenase (GDH) from cell-free extracts of Chlorella pyrenoidosa that had been grown on a medium containing citrate as a source of nitrogen. The GDH was found to be specific toward NAD (nicotinamide adenine dinucleotide) and NADP (nicotinamide adenine dinucleotide phosphate). Since purification had virtually no effect on the ratio between NAD-GDH and NADP-GDH activities, the authors conclude that only one enzyme is present in Chlorella cells and that the Chlorella GDH resembles that from animal livers. The conclusion was corroborated by data obtained during a study of the kinetic properties of GDH.
[5 figures, 4 tables, 20 references] [Abstracter: L. Baldwin]

7.590

The spin labels A and B solubilized by sodium dodecyl sulfate micelles gave weakly immobilized spectra similar to those obtained earlier using other nitroxide probes. The authors conclude that in the process of solubilization the movement of the probes is hindered by interaction with the micelle. Apparently the solubilized probe is in a liquid aggregate. Also, the lamellar structure of lecithin in water (0.5 percent solution) appears to be liquid in nature. But, a restricted motion of the solubilized spin-labeled lipids indicated that the lecithin bilayer is considerably more rigid than the structure of sodium dodecyl sulfate micelles.
[1 figure, 16 references]

6.54 (1.0151) THE FISH PROTEIN CONCENTRATE STORY. 9. EFFORTS IN INDIA

Moorjani, M. N., and N. H. Lahiry (Central Food Technological Research Institute, Mysore-2A, India)
Food Technology 24, No. 1, 56-59 (January 1970)

This report discusses the possibilities of converting surplus and low-cost varieties of fish into fish protein concentrate (FPC) and describes pertinent development work carried out in India. Good quality FPC could be prepared by ethanol extraction of fish. The product has had good acceptance. Some of the fish that could be used for commercial manufacture of FPC include oil-sardine, nonpenaeid prawns, Bombay duck, dhoma (J. dussumieri), silver bellies, and other miscellaneous fish.

The nutritional aspects and the use of FPC in regional dishes are discussed. A study is described in which FPC was given to a group of children (6 to 12 years old) in the form of chapaties (flat, baked cereal preparations). The children receiving the chapaties fortified with FPC during the 6-month test period showed a highly significant increase in height, weight, red blood cell count, and hemoglobin level over children of the same age group receiving the regular local diet adjusted isocalorically to the experimental diet.
[5 tables, 22 references] [Abstracter: F. T. Piskur]

6.54

300-day-a-year operation of a plant processing 100 tons of byproducts daily; (2) a raw material cost of $30 per ton; and (3) a selling price for MPC of $0.25 lb., for crude pork fat of $0.07 per lb., and for beef fat of $0.06 per lb.)
[1 figure]

7.0 NEW LABORATORY METHOD FOR EXPRESSING FISH FLUID

Vyncke, W. (Fisheries Res. Sta., Ministry of Agriculture, Ostend, Belgium)
Lab. Pract. 17, No. 7, 813-816 (1968)
Analytical Abstracts 17, No. 5, Item 3135 (November 1969)

The author used a disk-type hand press to extract expressible fluid from cod, redfish, and herring. He then analyzed the fluid for total solids, refractive index, total volatile bases, trimethylamine, and volatile reducing substances and investigated the factors affecting the efficiency of expression.
[Abstracter: L. Baldwin]

7.43 (9.19) COLORIMETRIC DETERMINATION OF DISSOLVED OXYGEN AT LOW CONCENTRATIONS

Broenkow, William W., and Joel D. Cline (Department of Oceanography, University of Washington, Seattle 98105)
Limnology and Oceanography 14, No. 3, 450-454 (May 1969)

The Winkler method (1888) is used almost exclusively in oceanographic work for determining dissolved oxygen, but when oxygen concentrations are less than 10 percent of the saturation value, it is imprecise. Moreover, atmospheric contamination can cause serious error, and, in addition, the method requires the use of special analytical and sampling procedures. Described here is a method for precisely measuring oxygen concentrations of between 0 and 50 µg.-atoms/liter. The authors do not offer it as a substitute for the Winkler method, although it is 10 times more precise, for it is useful only when the oxygen concentrations are low. [2 figures, 3 tables, 9 references] [Abstracter: L. Baldwin]

7.591 AUTOMATED MEASUREMENT OF PHOSPHATASES

Tappel, A. L. (Department of Food Science and Technology, University of California, Davis 95616)
Analytical Biochemistry 32, No. 3, 355-361 (December 1969)

This paper reports on the use of automated measurements of inorganic phosphate for the determination of any phosphatase activity when one product of substrate cleavage is inorganic phosphate. The methods consisted of the Automated Fiske-SubbaRow Determination and the Automated Lowry Determination. The two methods, as judged from their standard inorganic phosphate curves, showed similar sensitivities when readout is at 570 mμ. In order to apply automated methods that are applicable to the measurement of phosphatases from various sources with different pH and substrate requirements, the following enzymes were used: lysosomal acid phosphatase, microsomal glucose-6-phosphatase, mitochondrial Mg^{++}-activated ATPase, and a commercial preparation of acid phosphatase. The automated measurement of phosphatases should be useful where separations of tissues into subcellular fractions are routinely carried out. The purity of the major subcellular fractions and contamination of them by other fractions can be estimated by measuring the activity of the marker enzymes. For lysosomes, the relatively specific marker enzyme is acid phosphatase; for microsomes, glucose-6-phosphatase; and for mitochondria, Mg^{++}-activated ATPase. [5 figures, 14 references]

 Abstracter: F. T. Piskur

9.13 (4.2) GLYCERYL ETHER METABOLISM: REGULATION OF BUOYANCY IN DOGFISH SQUALUS ACANTHIAS

Malins, Donald C., and Anthony Barone (Bureau of Commercial Fisheries, Food Science Pioneer Research Laboratory, Seattle, Washington 98102)
Science 167, No. 3914, 79-80 (January 2, 1970)

Apparently glycerol ethers are widely distributed among the animals (Snyder, 1969). Although no distinct use for these compounds in nature has been established, clues to a possible role of glyceryl ethers in the life process may be found in the results of studies of the class of fish in which the compounds were first discovered (Tsujimoto and Toyama, 1922). Previous workers found that the livers (the fat content ranges from about 55 to 75 percent) of the dogfish contain high amounts of diacyl glyceryl ethers that are metabolized very rapidly. Such active turnover of these compounds suggests that the metabolism of glyceryl ethers is intimately related to the role of the liver as a hydrostatic organ. The present authors postulated that the specific gravities of the diacyl glyceryl ethers (DAGE) and triglycerides (TG) (the two main hepatic lipids) might be so significantly different that the buoyancy of the fish could be controlled by metabolic regulation of the ratio of the concentrations of the two classes of lipids.

The authors isolated DAGE and TG from the liver of dogfish and found the following specific gravities (at 25° C.): DAGE, 0.908 and TG, 0.922. Although the difference in specific gravities is not large, a unit weight of DAGE gives 14 percent more lift in sea water than the same unit weight of TG. An experiment was carried out in which the test group of live dogfish were weighted down with lead

(over)

 Abstracter: F. T. Piskur

7.86 (0.5) ACTIVATION OF COAGULASE CLOTTING BY TRYPSIN INHIBITOR

Orth, D. S., A. W. Anderson, and M. W. Montgomery (Department of Microbiology and Department of Food Science and Technology, Oregon State University, Corvallis 97331)
Applied Microbiology 18, No. 5, 906-910 (November 1969)

Certain staphylococci are able to clot blood plasma but only in the presence of a third factor (called the coagulase-reacting factor) found in the plasma of certain animals. The coagulase test is one of the best in vitro criteria for determining the potential pathogenicity of a staphylococcus. All the variations of coagulase testing for free coagulase use a suitable plasma substrate. Diluted plasma is often more satisfactory than full-strength plasma due to the dilution of plasma inhibitors. Plasmin, a blood serum protease, interferes with the coagulase reaction; however, plasmin is inactivated by trypsin inhibitor. Certain strains of staphylococci produce such small amounts of coagulase that they cannot be detected by the routine coagulase test. The purpose of the present study was to determine if the coagulase test could be made more sensitive by adjusting the level of the coagulase-reacting factor (CRF) and by adding trypsin inhibitor.

Egg white trypsin inhibitor activated the coagulase reaction when added to a final concentration of from 2 to 60 mg./ml. Reaction mixtures containing the lowest concentration of serum and plasma showed the greatest increase in clotting rate. Maximal activation of the reaction was obtained with 40 mg. of trypsin inhibitor per milliliter when either serum or plasma was used as the source of CRF. Apparently

(over)

 Abstracter: F. T. Piskur

9.13 (2.02)(1.82) EFFECT OF OXYGEN ON THE END-PRODUCTS OF GLYCOLYSIS IN RANGIA CUNEATA

Chen, Conrad, and J. Awapara (Biology Department, Rice University, Houston, Texas 77001)
Comparative Biochemistry and Physiology 31, No. 3, 395-401 (November 1969)

In 1964, Newell concluded that many intertidal mollusks are adapted to anaerobiosis and that many intertidal bivalves can survive for long periods of time in an oxygen-free environment. For example, Mya arenaria can live for 8 days without oxygen, Littorina neritoides and L. punctata can live for several days in a nitrogen atmosphere, and Rangia cuneata have lived in deoxygenated water for 3 weeks with no apparent ill effects. During anaerobiosis, bivalves such as Mya build up an oxygen debt, which is repaid by an increased pumping rate when the tide returns; bivalves such as Rangia and the oyster satisfy their energy requirements by degrading glucose to succinate and alanine. Although glucose is degraded by the well-known reactions of glycolysis until phosphoenolpyruvate (PEP) is formed, the pathway is unique--NADH formed during glycolysis is oxidized by linked reactions, leading to the conversion of PEP into succinate by the following sequence:

$$\text{PEP} \rightleftharpoons \overset{\overset{CO_2}{|}}{\text{OAA}} \rightleftharpoons \overset{\overset{NADH}{|}}{\text{MAL}} \rightleftharpoons \text{FUM} \rightleftharpoons \overset{\overset{NADH}{|}}{\text{SUC}}$$

The authors investigated the effect of oxygen on the use of U-^{14}C-glucose by the clam. They found that the clam uses oxygen for limited purposes--to oxidize

(over)

 Abstracter: L. Baldwin

9.11 TRAWL-BOARD SEDIMENT SAMPLER
(2.12)

Butler, T. H., and R. W. Sheldon (Fisheries Research Board of Canada Biological Station, Nanaimo, British Columbia)
Journal of the Fisheries Research Board of Canada 26, No. 10, 2751-2753 (October 1969)

This paper describes a sediment sampler that is fitted onto the shoe of a trawl otter board. It automatically collects a sample of bottom sediment at the beginning of a trawl tow. It was designed for use in exploratory shrimp trawling operations, but the authors suggest that it could be easily adapted to use in deep-sea trawling. The device consists of a short piece of steel pipe fixed at an angle of about 45° above an oval hole in the shoe of the otter trawl board. As the board moves across the sea bed, sediment is forced into the hole and is retained in the pipe. [2 figures, 4 references] [Abstracter: F. T. Piskur]

6.135 OIL ODOR IMPROVEMENT
German Pending Application 1,432,792
Dresser Industries Inc. (pat.)
Food Technology 24, No. 1, 85 (January 1970)

Countercurrent contact between triglyceride oils and steam is made possible by this centrifugal apparatus. [Abstracter: F. T. Piskur]

7.597 GAS-LIQUID CHROMATOGRAPHIC ANALYSIS OF FREE LONG-CHAIN ALDEHYDES
(4.11)

Wood, Randall, and R. D. Harlow (Medical Division, Oak Ridge Associated Universities Inc., Oak Ridge, Tennessee 37830)
Journal of Lipid Research 10, No. 4, 463-465 (July 1969)

This paper reports on the quantitative gas-liquid chromatographic (GLC) analysis of free long-chain fatty aldehydes on polar and nonpolar liquid phases and describes the conditions for handling this class of compounds without any apparent decomposition or polymerization. The authors obtained quantitative values for GLC of mixtures of free tetradecenal, hexadecenal, octadecenal, and cis-9-octadecenal. The aldehydes were eluted at comparatively low temperatures and gave symmetrical peaks on polar and nonpolar phases. The standard aldehyde mixtures that included the unsaturated oleraldehyde showed no detectable qualitative or quantitative change during storage for more than 1 year at -20° C. in carbon disulfide. Apparently the stability of the fatty aldehydes during chromatographic analysis and up to 1 year of storage (at -20° C.) is due to the antioxidant properties of the solvent (carbon disulfide) used. Analysis of the free aldehydes by GLC eliminates the various disadvantages associated with the preparation and analysis of derivatives for this lipid class.
[1 figure, 1 table, 18 references] [Abstracter: F. T. Piskur]

9.13

weights suspended between the pectoral fins. They were maintained in circular tanks for 50 hours in this condition along with a group of control (unweighted) dogfish. After the test period, the dogfish were killed and the livers were removed and examined for DAGE and TG. The triglycerides predominated in the control (unweighted) fish, whereas, the diacyl glyceryl ethers predominated in the experimental group (weighted) of dogfish. The authors postulate that a regulatory mechanism in dogfish, involving the selective metabolism of DAGE and TG, is used by the fish in the maintenance of neutral buoyancy during vertical migrations and that this regulatory mechanism may serve as a substitute for the commonly found gas-filled swim bladder. [1 figure, 1 table, 7 references]

3.63 DEHYDRATION PROCESSES FOR CONVENIENCE FOODS 1969
(9.6)

Noyes, Robert
Food Processing Review No. 2, 367 pp. (n.d.) $35
Noyes Data Corporation, Noyes Building, Park Ridge, New Jersey 07650

The 236 U.S. patents issued between January 1960 and 1968 covering food dehydration processes form the basis of this commercially oriented book.
[Abstracter: L. Baldwin]

7.89 ANALYTICAL CHEMISTRY IN TOXICITY TESTING
(4.92)

Gangolli, S. D. (British Industrial Biological Research Establishment, Woodmansterne Road, Carlshalton, Surrey, England)
Chemistry in Britain 5, No. 11, 510-513 (November 1969)

The long-term effect of a food additive is difficult to determine. In the case of natural food additives--such as oils or spices or gums, for example--determination is infinitely more difficult. In this article, the author discusses the three main aspects of toxicity testing (discovering the composition of the test compound; detecting early signs of its toxicity, including both the effect and the site of the toxic damage; and determining the metabolism of the compound). During the discussion, he examined some of the problems involved in toxicity testing of food additives.
[4 figures, 6 tables, 10 references] [Abstracter: L. Baldwin]

7.86

the increased rate of clotting is due to the inhibition of plasmin. Freezing and thawing the substrate reduced plasma-clotting inhibition. Soybean trypsin inhibitor activated the coagulase reaction. Increased rate of clotting occurred with a coagulase preparation from organisms that produced plasminogen activators and with the supernatant fraction of cultures from organisms that did not activate plasminogen to plasmin. The authors conclude that the tube test for coagulase can be made more sensitive for some strains of staphylococci by increasing the concentration of CRF (added as plasma or serum), by adding trypsin inhibitor, or by both procedures. [4 figures, 18 references]

9.13

NADH and, to a minor extent, succinate. When isolated mantle is incubated with U-^{14}C-glucose in an oxygen-saturated medium, the glucose is converted almost quantitatively into alanine whereas the formation of succinate is suppressed. The high yield of alanine strongly indicates that pyruvate is oxidized poorly, or not at all, under optimal aerobic conditions. Since the redox pair NADH/NAD is in a more oxidized state, succinate cannot be formed. Isolated mantle mitochondria do not oxidize pyruvate, malate, or α-ketoglutarate; it does oxidize NADH and succinate somewhat. When an excess of cytochrome-c is added, oxygen uptake is stimulated; however, only when succinate or NADH are the substrates is oxygen consumption by the mitochondria significant.

The authors conclude that the extent to which the oxidation of NADH and/or succinate contribute to the total energy requirement of Rangia remains to be established. But they express the belief that the contribution is small and that Rangia, and possibly many other bivalves, are essentially anaerobic.
[4 tables, 9 references]

9.13 (0.38) EFFECT OF TEMPERATURE ON THE ACTIVITY OF GLYCERALDEHYDE-3-PHOSPHATE DEHYDROGENASE; A COMPARISON OF HALIBUT AND RABBIT ENZYMES

Farrington, John W. (Graduate School of Oceanography, University of Rhode Island, Kingston) and Dwight L. Baker (Southeastern Massachusetts Technological Institute, North Dartmouth,02747)
Journal of the Fisheries Research Board of Canada 26, No. 9, 2517-2521 (September 1969)

The activity of land-based, cold-blooded animals usually decreases with a decrease in the temperature of the environment. In contrast, the activity of some fishes appears to be little affected by low temperature. The halibut, for example, when caught on hook and line in water as low as 3° C., can struggle long and vigorously, thus demonstrating the ability to generate a large amount of biological energy. Some of the enzymes involved in or associated with the locomotion of cold-water fishes may be more active at low temperatures than are the corresponding enzymes in mammals. Cowery (1967) found that the activity of the purified glyceraldehyde-3-phosphate dehydrogenase isolated from cod or lobster is less affected by a reduction in temperature than is the activity of the same enzyme isolated from rabbit. In the present study, the authors compared the effect of temperature on the catalytic activity of glyceraldehyde-3-phosphate dehydrogenase (TDH) that was isolated from the muscle of rabbit and of halibut.

They found that the activity of the enzyme isolated from halibut was less affected by temperature change than the enzyme from rabbit. The activation energy

(over)

 Abstracter: F. T. Piskur

9.15 SURVEY OF SOME SPONTANEOUS AND EXPERIMENTAL DISEASE PROCESSES OF LOWER VERTEBRATES AND INVERTEBRATES

Scarpelli, D. G. (Department of Pathology and Oncology, University of Kansas Medical Center, Kansas City, Kansas)
Federation Proceedings 28, No. 6, 1825-1833 (November-December 1969)

This report is a survey of the spontaneous and induced diseases of reptiles, amphibia, and fish, for these diseases appear to be of potential value as models for the study of disease processes in man. The animal models presented are selected, promising examples that have not been previously presented in such context although a number of pathologic reactions in vertebrates were discussed in a recent symposium (Federation Proceedings 26, 1664 [1967]).

This brief survey shows that the lower vertebrates and invertebrates represent a galaxy of animal models of wide diversity and many levels of organization. Most of the models have not been systematically studied or remain little more than biological curosities. Because there appears to be a unity of basic organization and function throughout biological systems, the experimental pathologist might find it useful to familiarize himself with the wealth of versatile and interesting animal models beyond those animals currently employed in the research laboratory.
[5 tables, 189 references]

 Abstracter: F. T. Piskur

9.13 (9.19) PATTERNS OF INSECTICIDE RESISTANCE IN THE MOSQUITOFISH, GAMBUSIA AFFINIS

Culley, Dudley D., Jr., and Denzel E. Ferguson (Department of Zoology, Mississippi State University, State College 39762)
Journal of the Fisheries Research Board of Canada 26, No. 9, 2395-2401 (September 1969)

The purpose of this study was to determine the extent of resistance and to identify the patterns of resistance in a field population of mosquitofish having a history of exposure to various insecticides. The extent of resistance to insecticides of a resistant population of mosquitofish from Belzoni, Mississippi, was compared with that of a susceptible population from State College, Miss.; 28 insecticides of 5 major groups were used. The major groups and number of insecticides in each group were:

Chlorinated hydrocarbons
- Group I. Diphenyl aliphatics (5)
- Group II. Chlorinated aryl hydrocarbons (8)

Organophosphates
- Group III. Aliphatic derivatives (8)
- Group IV. Phenyl derivatives (4)
- Group V. Heterocyclic derivatives (3)

The Belzoni population of resistant mosquitofish had developed high levels of resistance only to the Group II insecticides. Two levels of resistance were

(over)

 Abstracter: F. T. Piskur

9.16 (9.6)(9.2) REPORT ANALYZES CATFISH FARMING BOOM

Brown, Robert H. (reviewer)
A Synopsis of Catfish Farming
E. Evan Brown, M. G. LaPlante, and L. H. Covey
Feedstuffs 42, No. 3, 36-37 (January 17, 1970)

The authors of "A Synposis of Catfish Farming" are economists, so it is from an economics angle that they view their subject. The price of land, the amount of money needed to build ponds in typical locations, the type of construction that can reduce the cost of harvesting (to as little as 2¢/lb.), the cost of various kinds of feed, market prices, and the expected returns per acre under varying conditions are examined. The composition of several feed formulas are given, and the rates that they should be fed under different water-temperature conditions are specified. Some of the prices and costs given are tabulated below. Returns per acre when fish sell for 25¢, 30¢, 35¢, and 65¢ (liveweight) are calculated to be -$92.41, -$2.41, $87.59, and $627.59, respectively. Therefore, the tabulated returns are based on a market price of 35¢ per pound. This price gives a return that compares favorably with returns from other agricultural crops.

Land cost, per acre	$ 150	to $1,000
Feed costs, per ton	$ 100	to $ 206
Initial costs of 5-acre pond	$7,010	
Annual Production costs	$2,712.05	
Gross returns	$3,150	
Net returns	$ 437.95	

The book was released by the College of Agriculture, University of Georgia, Athens.

 Abstracter: L. Baldwin

9.13

apparent: (1) a high level of at least 357× to insecticides that included endrin, Strobane, heptachlor, and toxaphene and (2) a low level, less than 100×, to insecticides that included chlordane, aldrin, dieldrin, and lindane. Little resistance had developed to insecticides in the other four groups; the highest resistance levels outside the Group II insecticides were to DDT (Group I) of 5.1×; ethion (Group III) of 4.8×, and parathion (Group V) of 4.1×. Phosphamidon (III), Azodrin (III), Bidrin (III), OMPA (III), methyl parathion (IV), and CO-RAL (V) were excluded from further testing when the 48-hr. LC_{50} for the susceptible population exceeded 3,500 p.p.b. Two significant points stand out in the results of this study: (1) high resistance had developed to Group II insecticides even though only two (toxaphene and endrin) had been used in the area during the preceeding 4 years, and (2) little resistance had developed to other insecticides even though many of them [DDT (Group I), malathion and phosphamidon (Group III), methyl parathion (Group IV), and Guthion (Group V)] had been used in the area for insect control. The authors suggest that the widespread use of DDT, its stability, and the absence of DDT-resistant fish populations emphasize the danger of DDT, even though it is not the most toxic insecticide. Furthermore, the high toxicity and stability of certain insecticides, such as endrin, the high levels of resistance that have been developed from exposure to such compounds, and the ability of resistant fish to concentrate massive body burdens of residues pose a potential problem.
[3 tables, 16 references]

Singh, Eric J., and Leon L. Gershein (Northwest Inst. for Med. Res., Chicago, Ill.)
Chemical Abstracts 71, No. 25, 120897k (December 22, 1969)

8.53 FATTY ACIDS OF MARINE OILS AND PIG LIVER LIPIDS

9.16 URI ENGAGED IN "FISH FARMING"

Anonymous
The Fishermen's News 25, No. 2, 6 (December 1969)

Scientists from several departments at the University of Rhode Island (with the help of federal Sea Grant College funds, a foundation gift, and land provided by the Rhode Island Department of Natural Resources) are raising fish in much the same manner as farmers raise chickens. The aquatic version of the chicken coop is a group of galvanized steel pools lined with vinyl and containing sea water. Despite the normal habitat of the fish being raised--rainbow trout, salmon, bluefish, and striped bass--salt water piped from Point Judith Pond, an arm of Block Island Sound, is being used, for fish grow faster with less likelihood of disease in sea water than in fresh water. The size and age at which the fish can be transferred to salt water is one of the major problems being studied by the biologists. Associated problems are those involving the proper temperature of the water (facilities are incorporated into the water-supply system for heating the water slightly in winter and cooling it slightly in summer), the effects of water pollution on striped bass, and the mechanism that triggers the migration of fish to salt water. Researchers from the Department of Fisheries and Marine Technology are investigating diets (other than the pelleted diets and the trash-fish diets presently being used) that are both economical and healthful. The Department of Food and Resource Economics is simultaneously studying the marketing aspects of fish farming. The "farm" is at the URI Marine Experiment Station, Jerusalem, R.I.
[1 photograph] [Abstracter: L. Baldwin]

9.13

for the oxidative phosphorylation catalyzed by the rabbit enzyme is 12,200 cal./mole; for the reaction catalyzed by the halibut enzyme, 6,700 cal./mole. Both enzymes catalyzed reactions that had a constant energy of activation over the range of from 5° to 35° C. The results support the belief that the ability of fishes to move vigorously in a cold environment is, in part, made possible by a system of energy-producing enzymes that reduce the activation energies of the biochemical reactions to unusually low values.
[2 tables, 9 references]

Weiss, Burton A., William F. Strother, and George M. Hartig (University of Massachusetts, Amherst; Princeton University, Princeton, New Jersey; and University of Miami, Coral Gables, Florida)
Proceedings of the National Academy of Science of the U.S.A. 64, No. 2, 552-556 (October 1969)

Using shock-avoidance techniques in an aquatic shuttle box, the authors determined the auditory sensitivity of four bullhead catfish. They found that the fish's range of hearing extended from 100 to 4,000 c.p.s.; maximum sensitivity was about 600 or 700 c.p.s.
[1 figure, 20 references] [Abstracter: L. Baldwin]

9.125 AUDITORY SENSITIVITY IN THE BULLHEAD CATFISH (ICTALURUS NEBULOSIS)

9.16 DEGRADATION OF 1-NAPHTHOL IN SEA WATER
(9.19)

Lamberton, J. G., and R. R. Claeys (Department of Agricultural Chemistry, Oregon State University, Corvallis 97331)
Journal of Agricultural and Food Chemistry 18, No. 1, 92-96 (January-February 1970)

Earlier workers, Loosanoff et al. (1960), Lindsay (1961), and Haydock (1964), experimented with the use of carbaryl, 1-naphthol N-methylcarbamate, for predator control in oyster beds. But, before any chemical can be applied on a practical basis for predator control, we must evaluate and consider its possible toxic effects, if any, to the biological system. In the present study, the authors examined the fate of 1-naphthol-1-^{14}C in a simulated estuarine environment to determine if any potential hazard exists in the use of the chemical in oyster beds.

They found that (1) 1-naphthol is unstable in the alkaline environment, (2) light and microorganisms intensify the degradation of 1-naphthol to CO_2 and other products, and (3) 1-naphthol is fairly stable in an oxygen-free, aqueous solution and in the presence of cations similar to those found in sea water. A large proportion of the 1-naphthol in sea water formed a reddish-blue precipitate that had a molecular weight of 454 (a.m.u.). The precipitate contained a stable free radical and was toxic to bay mussel embryos.
[4 figures, 3 tables, 10 references] [Abstracter: F. T. Piskur]

Chadwick, George G., and Robert W. Brocksen (Oregon State Univ., Corvallis)
Chemical Abstracts 71, No. 25, 120983k (December 22, 1969)

9.19 ACCUMULATION OF DIELDRIN BY FISH AND SELECTED FISHFOOD ORGANISMS

9.16 MIXED FISH CULTURE IN PONDS AND THE ROLE OF TILAPIA IN IT

Yashouv, A. (Fish Culture Research Station, Dor, Israel)
Bamidgeh 21, No. 3, 75-92 (September 1969)

Experiments made on mixed fish cultures in ponds over the past several years at Dor and at various commercial ponds were aimed at a determination of the individual contribution of each species to the ponds' yield, the interaction of the species, and the most efficient exploitation of the ponds' potential. This article summarizes the experiments and the findings.

One of the factors that affects the yield of a fish pond is the mutual relations among the various fish species as a function of food preferences and competion for the food. These relations can be determined by comparing the growth increments of a species in monoculture with its growth in mixed culture. The degree of influence of one group of fish upon another can be calculated from the formula $C = \frac{a - b}{a}$, where C is the competition index, a is the daily yield of the species in monoculture, and b is the daily yield of the species in mixed culture. Using the formula, competition indices were derived for carp, tilapia, and mullet. The highest index, 0.066, was for tilapia with carp; it indicates that the tilapia population depressed the carp yield by 6.6 percent. Other indices derived were: mullet with carp, 0.15; mullet and tilapia with carp, 0.178; tilapia with mullet and carp, 0.033; and carp with mullet and tilapia, 0.26. These figures show that the competition of carp with supplementary fish is greater than the competition of the supplementary fish with carp. Mullets caused a decrease of 15 percent in

(over)

 Abstracter: L. Baldwin

9.19 (2.113) ECOLOGY OF FOULING ORGANISMS IN A POLLUTED AREA

Ignatiades, Lydia, and Th. Becacos-Kontos (Hydrobiology Group, Nuclear Research Center "Democritus," Aghia Paraskevi Attikis, Athens, Greece)
Nature 225, No. 5229, 293-294 (January 17, 1970)

The growth and development of fouling organisms in polluted areas is relatively unexplored. In 1961, Callaghan reported an extensive kill by crude or fuel oil of oysters and cockles in certain beds along the French and English coasts. Yet in 1950, Mackin had reported that oysters are very tolerant of crude oil overlying the water, emulsified in the water, or periodically sprayed on the shellfish themselves. The present authors did the work reported here to determine the extent of attachment and growth of fouling organisms in the very polluted port at Piraeus. Using wooden settling blocks suspended from a raft anchored at the dock, they monitored the temperature, salinity, dissolved oxygen content, transparency, and light penetrability of the water at monthly intervals from May 1968 through April 1969.

The predominant fouling organisms were Bugula simplex, Hydroides norvegica, Ciona intestinalis, Balanus amphitrite, and Mytilus edulis. Their maximum growth occurred from May to November, when the water temperature was from 22° to 26° C. From January through March, when the water temperature was from 14° to 16° C., they were virtually absent. They were resistant to the toxicity of the oil-polluted water, and those that were filter-feeders did not seem to be affected by

(over)

 Abstracter: L. Baldwin

9.19 (9.6) PROCEEDINGS OF THE NATIONAL SYMPOSIUM ON THERMAL POLLUTION

Krenkel, Peter A., and Frank L. Parker (Department of Environmental and Water Resources Engineering, Vanderbilt University, Nashville, Tennessee) (eds.)
Vanderbilt University Press, Nashville, Tennessee 37203 (n.d.)

The National Symposium on Thermal Pollution, jointly sponsored by the Federal Water Pollution Control Administration and Vanderbilt University, was held in two sessions, the first, on Biological Aspects of Thermal Pollution, in Portland, Oregon, June 3-5, 1968; the second, on Engineering Aspects of Thermal Pollution, in Nashville, August 14-16, 1968. The proceedings of these two sessions are available in two volumes from the Vanderbilt University Press for $7.95 each.

Biological Aspects of Thermal Pollution (xx + 407 pp., 77 illustrations, index) contains the following chapters: keynote address: effect of thermal loading of water ways; engineering aspects, sources, and magnitude of thermal pollution; remarks on the effects of heated discharges on marine zooplankton; aspects of the potential effect of thermal alteration on marine and estuarine benthos; banquet address; developing thermal requirements for fresh-water fishes; some effects of temperature on fresh-water algae; the effects of heated discharges on fresh-water benthos; theoretical considerations of the effects of heated effluents on marine fishes; effects of heated discharges on anadromous fishes; effects of heated discharges on fresh-water fishes in Britain; research needs for thermal pollution control; discussion.

(over)

 Abstracter: L. Baldwin

9.19 SHARK PIT ORGANS: ENHANCEMENT OF MECHANOSENSITIVITY BY POTASSIUM IONS

Katsuki, Yasuji, and Toru Hashimoto (Laboratory of Sensory Sciences, University of Hawaii, Honolulu 96822)
Science 166, No. 3910, 1287-1289 (December 5, 1969)

Two unusual phenomena in the cochlea of higher vertebrates have been observed: one is a d-c potential difference between the endolymph and perilymph (von Békésy, 1952) and the other is the high potassium content in the endolymph (Smith, Lowry, and Wu, 1954). These two phenomena appear to be intimately related and appear to support the extremely high sensitivities of cochlear hair cells to air-borne sound. The meaning of why the hair cells in the cochlea are immersed in potassium-rich medium (rarely found in other animal tissues) is still controversial from the phylogenetical point of view. It has been generally believed that the lateral-line canal and pit organs of fishes are the origin of the inner ear of higher animals because these organs seem to be highly developed mechanoreceptors in structure and function.

The authors found that the mandibular pit organs (which respond sensitively to monovalent cations) of pelagic sharks often show neural discharges synchronized with respiratory gill movements. The mechanosensitivity of the organs is enhanced by the application of potassium ions to the same end organ, with respiratory movement remaining constant. Because of their mechanosensitivity to an

(over)

 Abstracter: F. T. Piskur

9.19 PHOTOOXIDATION OF DDT AND DDE

Plimmer, Jack R., Ute I. Klingebiel, and Burton E. Hummer (Crops Research Division, Agricultural Research Service, Beltsville, Maryland 20705)
Science 167, No. 3914, 67-69 (January 2, 1970)

This paper reports on the photooxidation of DDT [1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane] and DDE [1,1-dichloro-2,2-bis(p-chlorophenyl)ethylene]. The two pesticides can be photooxidized in methanol. Free radicals are photolytically generated, and they may abstract hydrogen from the solvent, react with oxygen, or abstract hydrogen from unreacted substrate. The oxidation products include benzoic acids, aromatic ketones, and chlorinated phenols. The DDE also undergoes photocyclization, producing dichlorofluorene derivatives.
[1 figure, 2 tables, 8 references] [Abstracter: F. T. Piskur]

9.16 OYSTER CULTURE IN LONG ISLAND SOUND 1966-69
(1.81)

MacKenzie, Clyde L., Jr. (Bureau of Commercial Fisheries, Biological Laboratory, Milford, Connecticut 06460)
Commercial Fisheries Review 32, No. 1, 27-40 (January 1970) (Separate No. 859)

The oyster industry in the Long Island Sound waters of Connecticut and New York is rapidly developing improved methods for raising oysters. Prospects are good for a return to production levels equaling or exceeding those of some earlier periods. The resurgence of the industry has resulted from determination of the causes of seed oyster mortalities, and the development and application of methods for preventing these mortalities. Future increases in production will probably be made through even more effective control of mortalities--and collection of much larger numbers of seed oysters as a result of better preparation of private setting beds and restoration of public seed areas.
[11 figures, 7 references] [Reprinted in part]

9.11 CALORIC AND CARBON EQUIVALENTS OF ZOOPLANKTON BIOMASS

Platt, Trevor, Vivien M. Brawn, and Brian Irwin (Fisheries Research Board of Canada, Marine Ecology Laboratory, Bedford Institute, Dartmouth, Nova Scotia)
Journal of the Fisheries Research Board of Canada 26, No. 9, 2345-2349 (September 1969)

In studies of energy flow in marine ecosystems, values of zooplankton biomass (expressed as dry weight) are often converted into more general units, such as weight of organic carbon or quantity of calories. Little information is available on which to base such conversions, and apparently no information is available on any previous study that considers all three quantities--dry weight, carbon, and calories--for zooplankton on a seasonal basis. This paper reports on a study carried out throughout 1 year in St. Margaret's Bay, Nova Scotia (Canada). The caloric content per unit dry weight of zooplankton showed a fivefold variation. The present data, along with available information in the literature, indicated that dependence of caloric content of zooplankton (y) on percent organic matter (x) could be described by the equation $y = -3370 + 136x - 0.514x^2$. The caloric content is predicted from percent ash (a) and percent carbon (c) by the equation $y = 1351 + 106C - 21.2a$. Apparently, the relative stability of the caloric or carbon standing stock of zooplankton per unit water volume, compared with numbers or dry weight, may be an indication of some kind of regulatory mechanism controlling energy flow. [1 figure, 11 references] [Abstracter: F. T. Piskur]

9.12 ON THE DIURNAL CHANGE OF THE FEEDING ACTIVITY
(1.30)(2.1476) OF SALMON IN THE OKHOTSK SEA

Shimazaki, Kenji, and Seikichi Mishima (Research Institute of North Pacific Fisheries, Hokkaido University)
Bulletin of the Faculty of Fisheries Hokkaido University 20, No. 2, 82-93 (August 1969)

In the present paper the authors have qualitatively and quantitatively analyzed the feeding habits of salmon which were caught by gill nets, with special reference to the diurnal change of the feeding activity, based on the stomach contents.

From the combined results of the investigation, a remarkable diurnal feeding rhythm was observed: namely, the activity seems to become low in the daytime, then the fish eat vigorously in the evening before and after sunset.
[5 figures, 6 tables, 10 references] [Abstracter: L. Baldwin]

9.19 EFFECTS OF VARIOUS METALS ON BEHAVIOR OF CONDITIONED GOLDFISH

Weir, Patricia A., and Charles H. Hine (Department of Pharmacology (Toxicology Group), University of California, San Francisco Medical Center, San Francisco 94122)
Archives of Environmental Health 20, No. 1, 45-51 (January 1970)

Recent actions by the Government have created a general awareness that the contamination of aquatic resources is the proper concern of toxicologists. Although an excellent technique for measuring the lethality of an aquatic environment was developed by Doudoroff in the 1950's, evaluation and planning can reach only partial fulfillment if acute toxicity to organisms is the only criterion for assessing permissible levels of contamination. Therefore the authors demonstrate the value of using a behavioral method as a means of assessing sublethal toxicity.

Goldfish (Carassius auratus), which are shown as intermediate in most lists of relative sensitivity to toxicity, were conditioned to react to light and/or shock. When the reactions during conditioning trials were correct within 5 percent for 3 consecutive days, the fish were put into toxic exposure tanks. After 24 hours' exposure to sodium arsenate, lead nitrate, mercuric chloride, or selenium dioxide, the conditioned avoidance responses of the fish were tested, and the fish were returned to the exposure tanks. After a second 24 hours' exposure, they were tested again, but this time they were returned to the nontoxic holding tanks; every 24 hours they were retested. All four metal ions impaired performance at concentrations below the lethal concentration for 1 percent of the fish.

(over)

 Abstracter: L. Baldwin

9.2 YEARBOOK OF FISHERY STATISTICS
(9.6)

Anonymous
Food and Agriculture Organization of the United Nations, Vol. 26, xvi + 300 pp.; and Vol. 27, xvi + 321 pp. (1969)

These volumes bring up to date the annual statistics relating to catches and landings by country, by species, and by major fishing areas previously published in Volume 24 and to production and international trade in fishery commodities previously published in Volume 25. Data for 1968 have been added in all tables. Whenever it has been possible to obtain improved breakdowns or revised data, new figures have been incorporated in the tables. Certain changes have been made in both volumes. The NOTES that formerly appeared at the end of each volume have been deleted, and a trilingual Bulletin of Fishery Statistics will be issued instead. Readers therefore should consult Bulletin No. 20 or preceding volumes of the Yearbook. The world map and the graphs have been eliminated but might be issued separately as a Fisheries Circular.

In Volume 26, the tables in Section A now cover only 8 years instead of 20, thereby eliminating the need for facing pages. Pending the approval of certain changes in the International Standard Statistical Classification of Aquatic Animals and Plants, the various statistical items in Tables C3-1 "Crustaceans" and C3-2 "Molluscs" have been rearranged and grouped under various subheadings. Individual tables for these subgroups may be shown in future volumes of the Yearbook.

(over)

 Extracted from the Introduction

9.2 MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS
(9.19)(9.6)

Kneese, Allen V., and Blair T. Bower
Published by The Johns Hopkins Press, Baltimore, Maryland, x + 328 pp. (1968) illustrated, $8.95.
J. C. Fraser (reviewer)
California Fish and Game 56, No. 1, 74-75 (January 1970)

This book is an up-to-date review of the problems associated with water quality management and pollution control, with emphasis on economic analysis. The first part of the book summarizes the basic elements of the water quality problems facing the nation. Then, the economic concepts and policies for controlling waste discharges are treated. The authors explain the terms and concepts used in water management some of which are frequently confusing to the water quality biologist or manager untrained in economics. In the economic treatment of the pollution problems, the authors recognize the difficulty of assessing and properly weighing the values of intangibles and conclude that the levels of water quality to be achieved in each of the nation's watercourses cannot be directly established on economic grounds. Treated in detail are the cases for and problems associated with economic incentives for reducing waste discharges, incentive payments, benefits to industrial users, effluent standards, tax breaks, sewer discharges.

The authors conclude, on the basis of certain limited studies and analysis, that higher water quality must be justified primarily on aesthetic and recreational grounds, if it is to be justified at all. Furthermore, they believe that the

(over)

 Abstracter: F. T. Piskur

9.4 A MARINE "COMMON MARKET"
(1.014)

Reed, Laurance (Public Sector Research Unit [U.K.])
Hydrospace 2, No. 2, 8-10 (June 1969)

In a recent pamphlet, "Ocean Space, Europe's New Frontier" (Bow Publications, 5s), the author suggests that Europe's sea-space should be "Europeanized" and the ownership and development of its resources vested in a supranational, independent Oceanic Development Commission. The Commission would be free from the purse-strings of national exchequers; it would, as the licensing authority, have full powers of resource management, including the power (1) to allocate exploration and exploitation rights; (2) to limit the number of producers, the rate of production, and the acreage awarded; (3) to maintain orderly progress by resolving conflicts between alternative resource uses; (4) to determine the scale of fees and royalties to be paid; (5) to promulgate and enforce conservation measures, including fixing quotas, fishing areas and seasons, species that can be caught, the gear and fishing methods to be used, and the areas to be reserved for aquaculture and scientific experimentation; (6) to structure the market for ocean technology so that companies will have a chance to assess realistically their return from investment and so that technological effort will not be excessively fragmented; (7) to standardize tools, vehicles, and instruments; (8) to make aggregate purchases; (9) to build and operate a fleet of survey vessels and submersibles designed for locating and assessing the economic potential of marine products; and (10) to develop the human resources, possibly by founding an Ocean College devoted specifically to the study of all aspects of oceanology--legal, social, economic, strategic, political, scientific, and technical.

(over)

 Abstracter: L. Baldwin

9.6 (9.12)(2.14) PROCEEDINGS OF THE FAO CONFERENCE ON FISH BEHAVIOUR IN RELATION TO FISHING TECHNIQUES AND TACTICS

Ben-Tuvia, A., and W. Dickson (Marine Biology and Environment Branch, and Fishing Operations Branch, Fisheries Resources and Exploitation Division, Food and Agriculture Organization of the United Nations)
FAO Fisheries Report No. 62, Vol. 2, vi + 413 pp. (July 1969)

This second volume of the Proceedings of the FAO Conference (held in Bergen, Norway, 19-27 October 1967) on Fish Behaviour in Relation to Fishing Techniques and Tactics is in two parts. The first contains the 12 review papers presented at the conference; the second contains the first 18 experience papers presented there. Volume 3 will contain the remaining experience papers.

Twelve contributors from seven countries presented the review papers. Nineteen experts from eight countries contributed the experience papers.

[Abstracter: L. Baldwin]

In Volume 27, the tables on imports and exports by countries now cover 4 years instead of 8, thereby eliminating the need for facing pages. Space has also been saved by reducing from 6 to 3 years the coverage in tables on exports from principal exporting countries; these reductions have permitted the addition of a summary table to each of the subsections that give production statistics for the various fishery commodities. Certain fishery products--that is, fish cakes, pearl essence, mother-of-pearl, natural (wild or cultivated) pearls, seal skins, ambergris, sponges, fertilizers of aquatic animal or plant origin, bone meals, shell grit, and shells--that do not belong to the seven commodity groups for which statistics are given have been excluded.

9.2

6.130 FISH PROCESSING

German Pending Application 1,802,140
A/S Myrens Verksted (pat.)
Food Technology 24, No. 1, 48 (January 1970)

Fish are converted into fish meal and oil by a continuous process that employs heat and pressure. [Abstracter: F. T. Piskur]

The authors suggest that the method of conditioned avoidance testing, because of its reliability, could be used to reevaluate the risks of contaminants. Moreover, the results of such tests would be useful in setting water-quality standards. [4 figures, 4 tables, 14 references]

9.19

9.11 (9.6) OCEANOGRAPHIC ATLAS OF THE PACIFIC OCEAN

Barkley, Richard A.
Published by the University of Hawaii Press, Honolulu, 20 pp. + 156 full-page figures (1968) $30
Herbert W. Frey (reviewer)
California Fish and Game 56, No. 1, 75 (January 1970)

Some 3,000,000 individual observations of temperature, salinity, dissolved oxygen, and sampling depth made over a period of 50 years at more than 50,000 stations throughout the Pacific Ocean are the basis of this atlas. The reviewer says that the most significant feature of the procedures for processing observed data is the use of an interpolation technique based on density rather than depth as the independent variable. Values derived from the density relations reflect conditions in the upper layers of the sea better than do values derived from depth relations. Thus the atlas is of particular value to marine scientists concerned with the upper 2,000 meters of the Pacific Ocean. [Abstracter: L. Baldwin]

The Commission would be accountable to a Maritime Parliament, democratically elected by all the countries of Western Europe (including the three landlocked ones: Austria, Switzerland, and Luxembourg) that constitute the proposed marine community. Membership under certain conditions would also be extended to Eastern European countries. The sea-space to be claimed would embrace the whole of the continental margin around the shores of Europe--the geological shelf, slope, and continental rise. This pooling of their limited human and technical resources, says the author, is the European countries' only hope of profitably paralleling American effort in the business of exploiting ocean-space. [3 figures]

9.4

9.6 (8.8) QUALITY, STABILITY BOOK ON FF A CLASSIC

Anonymous
Quality and Stability in Frozen Foods, "Time-Temperature Tolerance" and Its Significance
Van Arsdel, Wallace B., Michael J. Copley, and Robert L. Olsen (eds.)
John Wiley & Sons, Inc., New York. 384 pp. (1969) $19.95
Quick Frozen Foods 32, No. 4, 18, 26 (November 1969)

The time-temperature tolerance of a frozen food expresses what will happen to the appearance, flavor, and nutritional value of the food if it is held at a variety of temperatures for various lengths of time. Masses of information on the most practical methods of handling frozen foods have been published in various forms and media. But until now the findings have never been put together in one place. This book collects those of experts on what will happen to a given food as a result of the manner in which it is frozen, packaged, stored, or merchandized. It tells what causes changes in the product and, if a method is known, how to prevent them. Its quick and easy reference data can help packers, warehousemen, truckers, distributors, retailers, and institutional buyers make money-saving decisions while, at the same time, serving as a valuable reference for laboratory researchers and instructors in food technology. [Abstracter: L. Baldwin]

Several case studies of river problems are discussed. Finally, the authors present their recommendations for a regional water quality management agency, treating the objectives, organization, criteria to be met, and financing.

Effluent charges approach is the one most likely to result in efficient and equitable arrangements and they recommend that the nation's policies be reoriented in this direction.

9.2

0.8 MIXING
(0.115)(0.6)
Oldshue, J. Y.
Industrial & Engineering Chemistry 61, No. 11, 121-127 (November 1969)

The annual review for 1968 covers publications dealing with the general subject of mixing. The various sections cover: General mixing; Impeller flow and fluid dynamics; Impeller power consumption; Homogeneous fluid mixing with impellers; Solid-liquid mixing with impellers; Liquid-liquid mixing with impellers; Gas-liquid mixing with impellers; Heat transfer with impellers; Impeller foam condensation; Gas-solid mixing with impellers; Paste mixing with impellers; Solid-solid mixing; Vibrating, Reciprocating, and Pulsating mixers; Fluid jets for mixing; Two-phase spargers; Flow distributors; Fluidized beds; Flow in conduits; Mathematical studies of single-stage mixing; and Mathematical studies of multistage mixing. [293 references] [Abstracter: F. T. Piskur]

0.8 DISTILLATION
(0.117)(0.6)
Bolles, William L., and James R. Fair
Industrial & Engineering Chemistry 61, No. 11, 112-120 (November 1969)

This annual review reports on publications dealing with the general subject of distillation and covers publications from July 1968 through June 1969. The various sections cover: General works, Research, Physical properties, Stage calculations, Hydrodynamics, Mass transfer and plate efficiency, Contacting equipment, Distillation processes, System dynamics and control, and Distillation design. [4 tables, 186 references] [Abstracter: F. T. Piskur]

6.34 EFFECT OF ALGINATE ON THE ABSORPTION AND EXCRETION OF ^{203}Pb IN RATS FED MILK AND NORMAL DIETS

Carr, T. E. F., J. Nolan, and A. Durakovic (Medical Research Council, Radiobiology Unit, Harwell, Didcot, Berkshire, England)
Nature 224, No. 5224, 1115 (December 13, 1969)

Because alginate selectively inhibits absorption of strontium from the diet, investigation of its use as a short-term dietary additive in environments contaminated by other metals seemed worthwhile. Using a standard laboratory diet with and without added sodium alginate and a low-fat milk-powder diet with and without added sodium alginate, the authors examined the effect of the alginate on the absorption of lead by female albino rats. The mean absorption, measured as urinary excretion plus carcass retention, of lead from each of the diets was 3.7±0.4 percent from the laboratory diet and 9.1±1.0 percent from the alginate-supplemented laboratory diet, 10.9±2.6 percent from the milk diet and 4.0±0.3 percent from the alginate-supplemented milk diet. The authors conclude that, since the effect of alginate on absorption of lead is small and dependent on dietary conditions, alginate therapy is apparently uncomplicated by an increase in lead absorption. On the contrary, the young, who are most vulnerable, might be slightly protected by such treatment. [1 table, 8 references] [Abstracter: L. Baldwin]

6.30 PRODUCTS FROM MARINE ALGAE
(9.6)

Burrows, E. M. (reviewer)
Marine Algae. A Survey of Research and Utilization
Tore Levring, Heinz A. Hoppe, and Otto J. Schmid
Botanica Marina Handbooks, Vol. 1, v + 421 pp. (1969) D40. Published by Cram, de Gruyter, Hamburg, Germany
Nature 225, No. 5227, 106-107 (January 3, 1970)

This translation of a German original is largely a synopsis of the information derived from an extensive survey of the literature. The chief emphasis is on the commercial products (substance by substance, in alphabetical order) obtained from algae, the processing techniques, and the uses of the products in industry and as food.

The reviewer points out several shortcomings of the book--for example, the omission of any reference to the dynamic aspects of marine communities relative to succession, seasonal and cyclic change, and migration; the lack of evidence on the seemingly erratic appearance and disappearance of algal populations; the failure to integrate the information given; the absence of a clear-cut indication of the actual lines on which research is progressing--but the inconsistent nomenclature troubles him most. If contact is to be kept between algologists and industrialists and if physiological and chemical work is to be meaningful, he says, experimental material must be carefully and correctly identified. He adds, however, that this criticism is not intended to detract from the value of a most useful synopsis. [16 plates, line drawings, tables, references] [Abstracter: L. Baldwin]

9.19 SENSITIVITY OF POND FISH TO COTNION (AZINPHOSMETHYL)
(9.15) AND PARATHION

Lahav, M. (Field Laboratory for Research of Fish Diseases, Nir David, Israel) and S. Sarig (Ministry of Agriculture, Fisheries Division)
Bamidgeh 21, No. 3, 67-74 (September 1969)

In this report of research supported by a grant from the Israeli Field-Crop Growers' Association, the authors examined the fish-poisoning potential of pesticides applied to field crops adjoining fish ponds. To find a way to limit the damage caused by the pesticides, they determined the lethal dosages as well as the concentrations that would not cause damage to the fish affected--carp, mullet, and tilapia.

Parathion and cotnion as supplied by the Field-Crop Growers' Association were dissolved in xylene at concentrations (w/v of active material) of 50 and 20 percent, respectively. Cotnion was found to be from five to ten times more poisonous to the fish than parathion is. In 96 hours, 0.2 p.p.m. cotnion killed all the carp, 0.04 p.p.m. killed all the tilapia, and 0.008 p.p.m. killed all the mullet. Carp were killed by 0.12 p.p.m. after 10 days' exposure but survived a concentration of 0.1 p.p.m. The highest nonlethal dosages for 96 hours' exposure were 0.1 p.p.m. for carp, 0.008 for tilapia, and 0.004 for mullet. The salinity of the water did not affect the mullet's sensitivity to cotnion. Continual periodic application of sublethal amounts (single exposure for 96 hours) down to 0.02 p.p.m. killed the carp.

In 96 hours, 1 p.p.m. parathion killed all the carp, 0.5 p.p.m. killed all the tilapia, and 0.125 p.p.m. killed all the mullet. The highest nonlethal dosage of parathion was 0.5 p.p.m. for carp, 0.25 for tilapia, and 0.1 for mullet. [4 tables, 9 references] [Abstracter: L. Baldwin]

Subject	Page No.	Code No.
ANALYSIS, GENERAL		
New Laboratory Method for Expressing Fish Fluid	20	7.0
Spectrophotometric Determination of Hydrogen Sulfide in Natural Waters	19	7.43
Colorimetric Determination of Dissolved Oxygen at Low Concentrations	20	7.43
ANALYSIS, ORGANIC		
Mass Spectrometric Analysis of Long-Chain Esters of Diols	13	4.11
Separation of Neutral Lipids of Shark Liver by "Dry-Column" Chromatography	14	4.11
Anaerobic Reductive Titrations With Solid Diluted Sodium Dithionite in an Apparatus Suitable for EPR Spectroscopy	19	7.51
Automated Measurement of Phosphatases	21	7.591
Gas-Liquid Chromatographic Analysis of Free Long-Chain Aldehydes	22	7.597
AUTHOR INDEX	32	
BACTERIOLOGY		
Comparison of the Fatty Acids of Proteolytic Type B and Nonproteolytical Types E and F of Clostridium botulinum	5	0.5
Fragin, a New Biologically Active Metabolite of a Pseudomonas. Part I. Isolation, Characterization and Biological Activities	5	0.5
Growth, Sporulation, and Germination of Clostridium perfringens in Media of Controlled Water Activity	6	0.5
Psychrophilic Properties and the Temperature Characteristic of Growth of Bacteria	6	0.5
Activation of Coagulase Clotting by Trypsin Inhibitor	21	7.86
BIOCHEMISTRY AND METABOLISM OF FISH		
Effect of Oxygen on the End-Products of Glycolysis in Rangia cuneata	21	9.13
Glyceryl Ether Metabolism: Regulation of Buoyancy in Dogfish Squalus acanthias	21	9.13
Effect of Temperature on the Activity of Glyceraldehyde-3-Phosphate Dehydrogenase; a Comparison of Halibut and Rabbit Enzymes	23	9.13
Patterns of Insecticide Resistance in the Mosquitofish, Gambusia affinis	23	9.13
BYPRODUCTS, MISCELLANEOUS		
Spun Protein Product (pat.)	18	6.54
MPC + Edible Fat	19	6.54
CHEMISTRY AND BIOCHEMISTRY		
Distribution of Dietary Squalene in a Wandering Albatross, Diomedea exultans	1	0.31
Radiation Chemical Studies of Protein Reactions: Radiation Dose and Optical Rotation	1	0.321
Effect of Protectors on the Breaking of Secondary Bonding in Protein	1	0.321
Mechanisms of Heat Damage in Proteins. 1. Models With Acylated Lysine Units	1	0.33
Loss of Methionine in Casein During Storage With Autoxidizing Methyl Linoleate	2	0.32
Bitter Peptides in Tryptic Hydrolysate of Casein	2	0.320
Radiation Chemical Studies of Protein Reactions: Effect of Amino Acids on Optical Rotation	2	0.321
Nitrosamines as Environmental Carcinogens	3	0.34
The Emulsifying Capacity of Bovine Muscle Tissue as Related to Time Post-Mortem and Microbial Contamination	3	0.35
Characterization of a Major Allergen (Cod). Effect of Enzymic Hydrolysis on the Allergenic Activity	3	0.38
Effects of Gamma Radiation on the Chemical and Physical Properties of Lactate Dehydrogenase	3	0.38
CHEMISTRY AND BIOCHEMISTRY--Continued		
Purification and Binding Properties of Nurse Shark Antibody	4	0.35
Multiple Forms of Lactate Dehydrogenase in the Cod, Gadus morhua L.	4	0.38
Purification and Partial Characterization of Peroxidase From Red Algae	4	0.38
[Cancers in Rats and Mice Fed With Commercial Fish Feeds]	5	0.7
Fluid Compartments of Islet and Other Tissues of the Toadfish Opsanus tau	6	0.39
A Spin-Labeled Lipid for Probing Biological Membranes	19	7.590
COMPOSITION, INORGANIC		
Concentration of Elements in Edible Aquatic Organisms	26	8.4
COMPOSITION, ORGANIC		
Fatty Acid Composition of Brain and Body Phospholipids of the Anadromous Salmon, Oncorhynchus nerka, From Fresh-Water and Marine Habitat	16	4.12
Fatty Acids of Marine Oils and Pig Liver Lipids	24	8.53
COMPOSITION, VITAMINS		
Vitamin B_6 Components in Some Meats, Fish, Dairy Products, and Commercial Infant Formulas	16	8.64
DISEASES AND POISONS OF FISH		
Survey of Some Spontaneous and Experimental Disease Processes of Lower Vertebrates and Invertebrates	23	9.15
DRIED AND DEHYDRATED FISH		
Freeze-Dried Meats (pat.)	12	3.2349
Effect of Oxygen Uptake on Quality of Cooked, Freeze-Dried Combination Foods	13	3.64
Dehydration Processes for Convenience Foods 1969	22	3.63
ECONOMICS AND STATISTICS		
Managing Water Quality: Economics, Technology, Institutions	27	9.2
Yearbook of Fishery Statistics	27	9.2
EXPLORATORY FISHING		
Bottom Trawl Explorations in Northern Lake Michigan, 1963-65	12	2.12
FISH CULTURE		
Report Analyzes Catfish Farming Boom	23	9.16
URI Engaged in "Fish Farming"	24	9.16
Oyster Culture in Long Island Sound 1966-69	26	9.16
FISH MEAL, NUTRITIVE VALUE		
Nutritive Content of Tuna (Mixed Species) Fish Meal Evaluated by Chemical Methods	17	6.190
Comparison of Different Types of Fish Meal in Practical Broiler Diets	17	6.195
The Effect of Hake Meal in Broiler Rations	18	6.19
FISH MEAL AND OIL, MANUFACTURE		
Solvent Extraction and Dehydration of Fat- and Water-Containing Tissues (pat.)	16	6.130
Oil Hydrogenation (pat.)	16	6.138
Oil Hydrogenation (pat.)	18	6.138
Oil Odor Improvement (pat.)	22	6.135
Fish Processing (pat.)	28	6.130
FISH PROTEIN CONCENTRATE		
The Fish Protein Concentrate Story. 9. Efforts in India	20	6.54
FISHERY BIOLOGY		
Shark Pit Organs: Enhancement of Mechanosensitivity by Potassium Ions	25	9.19

Subject	Page No.	Code No.
FISHING CONCERNS AND AGENCIES		
A Marine "Common Market"	27	9.4
FISHING METHODS		
Shrimp-Behavior Studies Underlying the Development of the Electric Shrimp-Trawl System	11	2.143
Experts Speak on: Pelagic Trawling. . ."Fishermen and Research" Conference at Trondheim	11	2.1471
Otter Trawling Introduced to Columbia River Smelt Fishery. A Progress Report	12	2.1471
FOOD TECHNOLOGY		
Sulfite Preservative Removal (pat.)	6	0.6
Feeding the Millions	8	0.7
Size Reduction	8	0.8
Distillation	29	0.8
Mixing	29	0.8
FROZEN FISH, CHANGES IN DURING FREEZING		
Glycolytic and Nucleotide Changes in the Critical Freezing Zone, -0.8 to -0.5 C, in Prerigor Cod Muscle Frozen at Various Rates	13	3.239
Quality, Stability Book on FF a Classic	28	9.6
FROZEN FISH, CHANGES IN DURING FREEZING AND COLD STORAGE		
Reaction of Free Fatty Acids With Protein in Cod Muscle Frozen and Stored at -29 C After Aging in Ice	13	3.2495
FROZEN FISH, PROCESSING		
Shrimp Freezing (pat.)	14	3.2342
GEAR, FISHING		
Clip Links Save Time in Trawl Changes	9	2.1121
Increasing the Efficiency of Gill Nets	9	2.1126
Some Effects of Shape and Structure of Fish on Selectivity of Gillnets	9	2.1126
Designing and Improved California Tuna Purse Seine	10	2.1125
Saury Resource for Bait of Tuna Long-Line Fishery (The Catch Rate and Injury Rate on Drift Net)	10	2.1127
HANDLING FRESH FISH		
Glyceride Frying Oils (pat.)	2	2.3
Fish Processing Apparatus (pat.)	4	2.3
Mollusk Processing (pat.)	4	2.3
Fish Processing (pat.)	10	2.3
Effect of Seawater Chilling on Landed Quality of Scallop Meat	12	2.15
Scallop Processing (pat.)	12	2.3
ICHTHYOLOGY		
Auditory Sensitivity in the Bullhead Catfish(Ictalurus nebulosis)	24	9.125
Degradation of 1-Naphthol in Sea Water	24	9.16
Mixed Fish Culture in Ponds and the Role of Tilapia in It	25	9.16
On the Diurnal Change of the Feeding Activity of Salmon in the Okhotsk Sea	26	9.12
Proceedings of the FAO Conference on Fish Behaviour in Relation to Fishing Techniques and Tactics	28	9.6
LOBSTERS		
Major Changes Called for in Maine Lobstering	7	1.87
MARINE PLANT PRODUCTS		
[Influence of Agar and Agar Extracts on Sendai Virus. I. Inhibition of Haemolytic Activity of Sendai Virus by Agar and Aqueous Agar Extract]	16	6.33
Thermophilic Blue-Green Algae and the Thermal Environment	17	6.31
Glutamate Dehydrogenase of Chlorella	20	6.32
Products from Marine Algae	29	6.30
Effect of Alginate on the Absorption and Excretion of ^{203}Pb in Rats Fed Milk and Normal Diets	29	6.34
NEW PRODUCTS		
Meat Chips--A New Snack Idea	12	3.9
NUTRITION AND MEDICINE, GENERAL		
Inhibition of Lymphatic Absorption of Cholesterol by Cholestane-3β,5α,6β-Triol	5	0.4
Phospholipid Synthesis in Microsomes	6	0.7
Malondialdehyde and Liver DNA	7	0.7
NUTRITIONAL VALUE OF BYPRODUCTS OTHER THAN MEAL		
Use of Fish Protein Concentrate in the Diets of Weanling Infants. A Study of 88 Infants From a Low Socioeconomic Population, Casablanca, Morocco	17	6.54
OCEANOGRAPHY		
Trawl-Board Sediment Sampler	22	9.11
Caloric and Carbon Equivalents of Zooplankton Biomass	26	9.11
Oceanographic Atlas of the Pacific Ocean	28	9.11
OILS, CHEMICAL AND PHYSICAL PROPERTIES		
Hydrocarbons of Dogfish and Cod Livers and Herring Oils	15	4.15
OILS, NUTRITION		
Fatty Acids in Newer Brands of Margarine	7	0.7
POLLUTION		
Accumulation of Dieldrin by Fish and Selected Fishfood Organisms	24	9.19
Ecology of Fouling Organisms in a Polluted Area	25	9.19
Proceedings of the National Symposium on Thermal Pollution	25	9.19
Photooxidation of DDT and DDE	26	9.19
Effects of Various Metals on Behavior of Conditioned Goldfish	27	9.19
Sensitivity of Pond Fish to Cotnion (Azinphosmethyl) and Parathion	29	9.19
PRESERVATIVES AND SANITATION		
Effect of EDTA Treatment on Spoilage Characteristics of Petrale Sole and Ocean Perch Fillets	11	3.12
QUALITY CONTROL		
DTA for Quality Control of Oils and Fats	15	4.11
Improvement of Detection Limits of Flame-Spectrophotometric Determination of Chlorinated Organic Pesticide Residues	20	7.89
RANCIDITY		
Effect of Hematin Compounds on the Development of Rancidity in Muscle of Cod, Flounder, Scallops, and Lobster	15	4.5
SMOKED FISH		
Smoking Apparatus (pat.)	2	3.4
Volatile Components of Hardwood Sawdust Smoke Components of Phenolic Fraction	14	3.4
SPOILAGE		
Salmonella--Menace or Myth?	7	2.05
VITAMINS, B-COMPLEX		
Protective Effect of Casein on Cleavage of Thiamine by Sulfite	15	5.2
TOXICITY		
Analytical Chemistry in Toxicity Testing	22	7.89
VESSELS		
Hydraulic Steering System on Fishing Vessels	9	2.114
Consultant Finds Ferro-Cement Has Limitations	11	2.117

Author	Page	Code
Aas, K.	3	0.38
Ackerman, S. A.	12	3.9
Akulin, V. N.	16	4.12
Allen, T. M.	4	0.38
Ambrose, M. E.	17	6.190
Anderson, A. W.	5	0.5
	21	7.86
Anderson, Margaret L.	13	3.2495
Andrzejewski, Jerzy	16	6.33
Arscott, G. H.	18	6.19
Awapara, J.	21	9.13
Baig, I. A.	6	0.5
Baker, Dwight L.	23	9.13
Barkley, Richard A.	28	9.11
Barone, Anthony	21	9.13
Barth, Howard	2	0.32
Baumann, W. J.	13	4.11
Becacos-Kontos, Th.	25	9.19
Beinert, Helmut	19	7.51
Ben-Tuvia, A.	28	9.6
Ben-Yami, M'nakhem	10	2.1125
Berst, A. H.	9	2.1126
Bishop, D. M.	15	4.5
Bjarnason, J.	1	0.33
Blackwood, C. M.	12	2.15
Blanchette, E. J.	5	0.4
Bolles, William L.	29	0.8
Bower, Blair T.	27	9.2
Boyer, R. A.	18	6.54
Brawn, Vivien M.	26	9.11
Brocksen, Robert W.	24	9.19
Broenkow, William W.	20	7.43
Brown, E. Evan	23	9.16
Brown, Robert H.	23	9.16
Burrows, E. M. (rev.)	29	6.30
Butler, T. H.	22	9.11
Cahill, V. R.	3	0.35
Carpenter, K. J.	1	0.33
Carr, T. E. F.	29	6.34
Casey, Andria C.	14	4.11
Castell, C. H.	15	4.5
Castenholz, Richard W.	17	6.31
Chadwick, George G.	24	9.19
Chapman, William H.	26	8.4
Chebotarëva, M. A.	16	4.12
Chen, Conrad	21	9.13
Cheney, Roberta	6	0.5
Claeys, R. R.	24	9.16
Clegg, W.	17	6.190
Cline, Joel D.	19	7.43
	20	7.43
Connor, W. E.	5	0.4
Cooke, G. W.	8	0.7
Cooperstein, S. J.	6	0.39
Copley, Michael J. (ed.)	28	9.6
Covey, L. H.	23	9.16
Crawford, David L.	18	6.19
Culley, Dudley D., Jr.	23	9.13
Dąbrowski, Waldemar	16	6.33
Davisson, Farrell (rev.)	7	1.87
Day, Elbert J.	17	6.195
Dickson, W.	28	9.6
Dilworth, Ben C.	17	6.195
Durakoviċ, A.	29	6.34
Dyer, W. J.	13	3.239
Ellis, Ian E.	12	2.1471
Elsayed, S. M.	3	0.38
Epstein, Samuel S.	3	0.34
Evstigneeva, Z. G.	20	6.32
Fair, James R.	29	0.8
Farrington, John W.	23	9.13
Ferguson, Denzel E.	23	9.13
Ferretti, Aldo	4	0.33
Fisher, H. Leonard	26	8.4
Flanagan, V. P.	4	0.33
Fox, J. B., Jr.	12	3.9
Gangolli, S. D.	22	7.89
Gardner, John	11	2.117
Gershbein, Leon L.	15	4.15
	24	8.53
Gonik, Alexander	17	6.54
Gorman, T. B.	9	2.1126
Graner, Murilo	3	0.35
Green, Roger E.	10	2.1125
Griffith, O. H.	19	7.590
Grimes, E. L.	14	3.2342
Gutsche, Brigitte	20	7.89
Han, Hak Soo	10	2.1127
Harlow, R. D.	22	7.597
Hartig, George M.	24	9.125
Hashimoto, Toru	25	9.19
Hata, Kosei	5	0.5
Hata, Tadao	2	0.320
Hayashi, Rikimaru	2	0.320
Hayes, H. W.	13	4.11
Helmer, R. L.	13	3.64
Henderson, T., Jr. (pat.)	4	2.3
Herrmann, Roland	20	7.89
Hine, Charles H.	27	9.19
Hinnergardt, L. C.	13	3.64
Holman, R. T.	13	4.11
Hopton, J. W.	6	0.5
Hueper, Wilhelm C.	5	0.7
Hummer, Burton E.	26	9.19
Hutchinson, Joseph (ed.)	8	0.7
Ignatiades, Lydia	25	9.19
Irwin, Brian	26	9.11
Issenberg, Phillip	14	3.4
Ito, M.	5	0.4
Jackson, James A.	6	0.39
Jo, Tae Hyun	10	2.1127
Joslyn, M. A.	15	5.2
Kang, Chunghee K.	6	0.5
Karrick, N. L.	17	6.190
Katsuki, Yasuji	25	9.19
Keith, A. D.	19	7.590
Kifer, R. R.	17	6.190
Kimble, C. E.	5	0.5
Kingzett, T. J.	19	7.590
Klima, Edward F.	11	2.143
Klingebiel, Ute I.	26	9.19
Kneese, Allen V.	27	9.2
Krenkel, Peter A. (ed.)	25	9.19
Kreps, E. M.	16	4.12
Kretovich, V. L.	20	6.32
Lahav, M.	29	9.19
Lahiry, N. H.	20	6.54
Lamberton, J. G.	24	9.16
LaPlante, M. G.	23	9.16
Lazarow, Arnold	6	0.39
Leichter, Joseph	15	5.2
Le Roux, J. P.	2	0.32
Leung, T. C.	4	0.38
Levering, Tore	29	6.30
Levin, E. (pat.)	6	0.6
Levin Ezra	19	6.54
Lewis, R. W.	1	0.31
Lijinsky, William	3	0.34
Linteris, L. L.	2	2.3
Lustre, A. O.	14	3.4
MacKenzie, Clyde L., Jr.	26	9.16
Malins, Donald C.	21	9.13
Marvin, J. (pat.)	4	2.3
Matoba, Teruyoshi	2	0.320
McCollough, M. L.	5	0.5
McCombie, A. M.	9	2.1126
McNaught, J. P.	2	2.3
Meyer, L. (pat.)	12	2.3
Miljanich, Peter	7	0.7
Mishima, Seikichi	26	9.12
Montgomery, M. W.	21	7.86
Mook, D. E.	12	3.2349
Moorjani, M. N.	20	6.54
Murayama, Akira	5	0.5
Murphy, M. J.	4	0.38
Nagayasu, Chizuko	2	0.320
Nisizawa, Mizuho	1	0.321
	1	0.321
	2	0.321
Nolan, J.	29	6.34
Nowlan, Sandra S.	13	3.239
Noyes, Robert	22	3.63
Ockerman, H. W.	3	0.35
Odense, P. H.	4	0.38
Ó hEocha, C.	4	0.38
Oldshue, J. Y.	29	0.8
Olsen, Robert L. (ed.)	28	9.6
Orme-Johnson, W. H.	19	7.51
Orth, D. S.	21	7.86
Ostwald, Rosemarie	7	0.7
Pagenkopf, Andrea	6	0.5
Parker, E.	4	0.38
Parker, Frank L. (ed.)	25	9.19
Paterno, V. A.	5	0.5
Pelroy, Gretchen A.	11	3.12
Piller, A. (pat.)	2	3.4
Platt, Trevor	26	9.11
Plimmer, Jack R.	26	9.19
Polansky, Marilyn M.	16	8.64
Ravesi, Elinor M.	13	3.2495
Reece, Tyron C.	3	0.38
Reed, Laurance	27	9.4
Reeves, John P.	7	1.87
Reigle, Norman J., Jr.	12	2.12
Roberts, P. L.	12	3.2349
Rottschaefer, S.	19	7.590
Russell, Warren J.	4	0.35
Ruth, J. M.	4	0.33
Sarig, S.	29	9.19
Scarpelli, D. G.	23	9.15
Schatzman, E. A.	18	6.54
Schmid, Otto J.	29	6.30
Schulz, A. A.	18	6.54
Seman, John P., Jr.	11	3.12
Seufert, J.	13	4.11
Shatilov, V. R.	20	6.32
Sheldon, R. W.	22	9.11
Shimazaki, Kenji	26	9.12
Sigel, M. Michael	4	0.35
Singh, Eric J.	15	4.15
	24	8.53
Snow, Richard H.	8	0.8
Stansby, M. E.	17	6.190
Stockley, Clint	12	2.1471
Strother, William F.	24	9.125
Tamura, Saburo	5	0.5
Tannenbaum, S. R.	2	0.32
Tappell, A. L.	21	7.591
Tavill, Frederick	17	6.54
Thomas, R. Dean	7	2.05
Toepfer, Edward W.	16	8.64
Treadwell, C. R.	5	0.4
Tuomy, J. M.	13	3.64
Vahouny, George V.	5	0.4
Van Arsdel, Wallace B. (ed.)	28	9.6
Varga, S.	12	2.15
Voss, Edward W., Jr.	4	0.35
Vyncke, W.	20	7.0
Waggoner, A. S.	19	7.590
Weir, Patricia A.	27	9.19
Weiss, Burton A.	24	9.125
Winstead, Jack A.	3	0.38
Wood, Randall	22	7.597
Wood, Ray A.	9	2.114
Woodburn, Margy	6	0.5
Yashouv, A.	25	9.16
Yoshida, S. (pat.)	4	2.3

USE OF FUNDS FOR PRINTING THE ABSTRACTS WAS APPROVED
BY THE DIRECTOR OF THE BUREAU OF THE BUDGET APRIL 18, 1968.

DIVISION OF PUBLICATIONS

Leslie W. Scattergood, Chief

COMMERCIAL FISHERIES ABSTRACTS

Editorial Staff

Frank T. Piskur ..... Editor
Lena Baldwin ..... Associate Editor
Gladys K. Chandler ..... Editorial Clerk

Advisors

F. Bruce Sanford ..... Editorial Advisor
Maurice E. Stansby ..... Technical Advisor

COMMERCIAL FISHERIES ABSTRACTS is available to members of the fishing industry and allied interests. Requests for instatement on the mailing list should be addressed to

Bureau of Commercial Fisheries
Division of Publications
Bldg. 67, U.S. Naval Air Station
Seattle, Washington 98115

REPRINTS of articles or other material from which abstracts are drawn should be requested either from the author or from the publishing outlet. Addresses of these outlets are printed in *Commercial Fisheries Abstracts* about once a year.

CODE NUMBERS used to identify the subject of abstracts are translated in Fishery Leaflet No. 232, "Fishery Technological Abstract Card System." The Leaflet is obtainable free from this Bureau.

Use of trade names in abstracts
does not imply endorsement of commercial products.

GPO 997-060

UNITED STATES
DEPARTMENT OF THE INTERIOR
U.S. FISH AND WIDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES
DIVISION OF PUBLICATIONS
BLDG. 67, U.S. NAVAL AIR STATION
SEATTLE, WASHINGTON 98115

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States — now and in the future.